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U. S. Government

RESEARCH REPORTS

February 5, 1962
Vol. 37, No. 3

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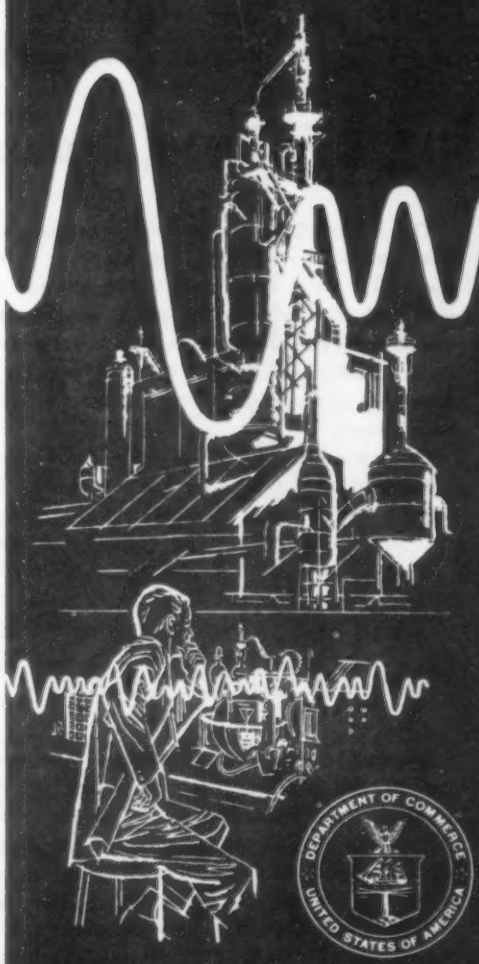

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

Office of Technical Services
John C. Green, *Director*

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-266 154 Div. 1, 2
(TIPTA/WAW) OTS price $6.60

Stanford Research Inst., Menlo Park, Calif.
HIGH ALTITUDE WEATHER HAZARDS TO FLIGHT.
Final rept.,
by Roland E. Nagle. July 61, 56p. incl. illus. tables, 31 refs.
(Contract AF 19(604)7397)
(AFCRL-654)
Unclassified report

DESCRIPTORS: (Airplanes, High altitude, Hazards.) (*Aviation accidents, Analysis, Reduction.) (*Storms, Radar analysis, Radar reflections.) (*Meteorology, Wind, Atmosphere, Jet streams (Meteorology), Analysis.)

Radar-meteorological analyses were conducted on 14 accidents involving damage or destruction of aircraft in severe thunderstorms at altitudes above 25,000 feet. It was found that radar echoes from convective storms in which violent conditions aloft were known to exist have distructive characteristics. Relationships were found between the surface and upper air patterns and locations of the accidents. A close correspondence was found between areas of violent convection aloft and strong winds in particular multiple-jet-stream configurations at and above the 400 millibar pressure level. Eight accidents in which the aircraft was destroyed, but for which radar data were not available, were used to check the findings. In 7 of these cases, agreement was excellent. A method for delineating areas of potentially hazardous flight conditions is suggested. An operational program for in-flight avoidance of severe weather is also described. (Author)

AD-266 167 Div. 1, 8
(TIPTA/LSK) OTS price $1.60

4750th Test Squadron (Tactics and Application Engineering) Tyndall Air Force Base, Fla.
F-106/MA-1 MOISTURE INVESTIGATION.
Final rept.,
by David W. Tobey. 31 Aug 61, 19p. (Proj. ADC/73AD/61-11)
Unclassified report

DESCRIPTORS: (Jet fighters, Aircraft equipment, Electronic equipment, *Computers, Coaxial cables, Failure (Mechanics), Moisture, Moisture-proofing, Air conditioning equipment, Thermostats, Flight testing, Tests.)

In an effort to reduce F-106/MA-1 failures under high temperature/dew point conditions, two modifications were proposed. They were the Convair 60 thermostat and the Hughes moistureproof coaxial cables. Headquarters ADC directed an operational suitability test to evaluate these proposals. During sixteen valid test flights, twelve MA-1 computer failures occurred due to excessive moisture. There were no coaxial cable failures. The Convair 60 degree thermostat does not prevent excessive moisture from accumulating in the MA-1 system at 1,000 feet under high temperature/dew point conditions. The Hughes moistureproof coaxial cables prevent cable failures as a result of moisture. They do not prevent MA-1 system failure due to excessive moisture. Further engineering study and follow-on tests to alleviate moisture problems are recommended. (Author)

AD-266 172 Div. 1
(TIPTA/SEB) OTS price $1.60

4750th Test Squadron (Tactics and Application Engineering) Tyndall Air Force Base, Fla.
SUPPORT OF AERONAUTICAL SYSTEMS DIVISION TEST ON F-106 SUPERSONIC SOFT PACK PARACHUTE.
Final rept.,
by Norman R. Smedes. 18 Aug 61, 13p. incl. illus. (Proj. ADC/73AD/61-7)
Unclassified report

DESCRIPTORS: Jet fighters, Ejection seats, *Parachutes, Packs, Survival kits, Tests, Design.

Aeronautical Systems Division recently completed a test of the F-106 Supersonic Soft Pack Parachute. This is a report of the observations of the ADC participant. Discrepancies were observed to exist in the raft deployment mechanism, the survival kit deployment mechanism, the raft packing method, and the compatibility of the equipment with water landings. The soft pack parachute will be redesigned to eliminate discrepancies. It is recommended that ADC monitor and support, as required, further development and testing of the F-106 Supersonic Soft Pack Parachute. (Author)

AD-266 236 Div. 1
(TIPTA)SEB) OTS price $4.60

Winzen Research, Inc., South St. Paul, Minn.
STRATO-LAB OPEN GONDOLA - HIGH ALTITUDE OBSERVATORY BALLOON FLIGHT NO. 1.
Final rept.
15 Sep 61, 40p. illus. (Rept. no. 1268-R)
(Contract Nonr-146012)
Unclassified report

DESCRIPTORS: (*Balloons, Astronomical observatories, Balloon gondolas, High altitude, Flight, Flight paths, Flight testing.) Astronomical data, *Sky brightness, Protective clothing, Flight clothing, Physiology, Communication systems, Instrumentation.

The Strato Lab Open Gondola was launched at 0540 MST on 7 August 1959 near Rapid City, S. D. The flight was conducted to measure the variation in sky brightness near the sun as a function of altitude to a maximum of about 40,000 ft. Secondary objectives were (1) to obtain physiological data regarding the respiration, ekg and

temperature of the flight crew during the flight, (2) to conduct performance evaluation tests of special exposure clothing, and (3) to obtain data regarding the system stability and orientation control with respect to its suitability for use as an astronomical observation platform. The flight trajectory was generally eastward throughout the entire duration. A floating altitude of about 38,000 MSL was maintained for 31/2 hr. The landing was made near Milford, Iowa at 1425 MST. The operation of the Aerostat System was in general successful. Communication difficulties were encountered but they did not directly affect the astronomical observations. (Author)

AD-266 269 Div. 1, 19
(TIPTW/EET) OTS price $11.00

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF PARALLEL RUNWAY SPACING,
by J. A. Fantoni and R. D. Rudich. July 61, 145p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Airports, Air traffic, *Air traffic control systems.) (*Airport radar systems, *Ground controlled approach radar, *Radar navigation, Radar equipment, Effectiveness.) (Runways, Airplane landings, *Instrument landings.) (Statistical analysis of Flight paths, Flight testing, Navigation computers, Digital computers.)

A flight test program was conducted at Chicago-O'Hare International Airport and the National Aviation Facilities Experimental Center to investigate instrument landing system approaches under dual- and single-runway configurations. Aircraft flight paths were recorded and the effect of various equipment applications and control procedures observed. The results are analyzed to determine control procedures and equipment requirements for fail-safe operation of parallel runways. Various control procedures and equipment, as well as factors affecting aircraft overshoots and lateral deviations of instrument landing system approaches, are discussed. (Author)

AD-266 319 Div. 1
(TIPTA/SEB) OTS price $1.25

Research, Inc., Hopkins, Minn.
TESTS OF AN ARRESTING CABLE POP-UP SYSTEM,
by J. A. Zdrazil. June 61, 44p. incl. illus. tables.
(Contract AF 33(600)37942, Proj. 6073)
(ASD TN 61-64) Unclassified report

DESCRIPTORS: (Jet fighters, Jet planes, Landing, Airplane landings, *Arresting gear, Hooks, Design, Feasibility studies, Test methods, Tests.) Jet bombers.

The aircraft engaging system was installed on a test runway. Engagement tests were conducted with B-47B, F-84G and F-100A aircraft. Operational engagements were successfully completed on a break-away hook on the F-84G and F-100A, and on a standard arresting hook on the B-47B. Engagements were made at velocities of 11 to 165 knots. Successful emergency engagements were made on the main wheel struts at velocities of 14 to 143 knots. The equipment and procedures for conducting these tests are described. (Author)

AD-266 326 Div. 1, 9
(TIPTA/WAW) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
RESULTS OF GEM III TETHERED TESTS,
by Arthur E. Johnson and Harvey R. Chaplin. Aug 61, 20p. incl. illus. (Rept. no. 1546; Aero rept. no. 1012)
Unclassified report

DESCRIPTORS: (*Flying platforms, Tests, Flight testing.) (*Stability, Stability (Lateral), Stability (Longitudinal), *Control, Measurement.) (Spoilers, Effectiveness.) (Nozzles, Guide waves, Effectiveness.) (Control systems, Roll, Pitch.)

Static test results on hovering performance, pitch and roll stability, and control effectiveness are presented. The vehicle hovered at a height of 14 inches with a gross weight of 1850 pounds. Both pitch and roll stability were practically neutral at this height (weak stability was measured at lower heights). Propulsion, braking, and steering controls, accomplished by means of variable-camber vanes in the main nozzles, were partially effective. Pitch and roll controls, accomplished by a system of four dump valves bleeding air from the cushion, were completely ineffective. Some data were obtained which indicated that a simple jet spoiler installation could provide satisfactory pitch and roll control. (Author)

AD-266 512 Div. 1
(TIPTA/SEB) OTS price $2.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE.
Interim rept. no. 17, 1-31 Oct 61,
by C. V. Lassmann. 8 Nov 61, 25p. incl. illus. tables (Engineering rept. no. 4249)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: (Naval aircraft, Jet fighters, Transport planes, *Airplane refueling, Refueling in flight.) (Airplane protuberances, Airplane noses, Booms, Structures, Manufacturing methods, Design.)

Satisfactory progress was achieved in the development of the Beech Model 385 Air Refueling Store. A realigned program plan has been established which indicates completion of major phases within the original schedule. Problems regarding development and procurement of store components were resolved and no additional major problems were encountered. Substantial progress has been made on assembly of the first prototype store. (Author)

AD-266 604 Div. 1, 7, 8
(TIPTW/JRG) OTS price $1.60

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
TECHNICAL NOTE, NAVAIRDEVCEN PRESENTATIONS TO THE BUREAU OF NAVAL WEAPONS SYMPOSIUM ON ADVANCED WIRING TECHNIQUES FOR NAVAL AIRCRAFT ELECTRIC SYSTEMS, 14 SEPTEMBER 1961.
by P. F. Ardizzi and J. R. Garnett. 2 Nov 61, 12p. (Rept. no. NADC-EL-N6195)
Unclassified report

DESCRIPTORS: (*Symposia, Naval aircraft, Elec-

tric cables, Electric connectors, Electric wire, Printed circuits, *Electrical equipment, Electronic equipment.) Airborne, Aircraft equipment.

Transcripts of papers presented by NAVAIRDEVCEN engineers at the subject symposium are presented. They are: (1) Evaluation of components for printed circuits for aircraft electric systems - by P. F. Ardizzi; (2) Survey of multi-conductor cables for interconnecting cables and harnesses - by P. F. Ardizzi; (3) Progress report on the application of flat cable to interconnection wiring - by J. R. Garnett. (Author)

AD-266 807 Div. 1, 31
(TIPTW/RD) OTS price $2.60

Bell Helicopter Corp., Fort Worth, Tex.
A SURVEY OF VERTICAL DISPLAY CONTACT ANALOG SYSTEMS,
Technical data rept. for Sep-Oct 61 on Army-Navy Instrumentation Program,
by T. M. Brown. Oct 61, 18p. incl. illus.
(Rept. no. D228-201-001)
(Contract Nonr-167000)
Unclassified report

DESCRIPTORS: (*Display systems, Airborne, Analog systems.) (Helicopters, Attack bombers, Naval aircraft, Transport planes, Instrumentation.) (Display systems, Tables, Data.) (Display systems, Submarines.)

The state of development is discussed of various vertical display systems which utilize a contact analog ground plane presentation, a pathway or other form of director, and various special symbols. The objective is the uniform presentation of data to all personnel in the field of information presentation. Information is presented in chart form for the vertical display systems used in the Bell RH-2 research helicopter, the Grumman A2F attack aircraft, the Douglas Aircraft simulator, and the SUBIC submarine programs. There is also a description of work being performed at Johnsville, AIL, with part of the Grumman system installed in an R4Y aircraft. The results, including descriptions of sensors and computers used to drive the vertical display systems, should provide convenient reference. (Author)

AD-266 873 Div. 1
(TIPTA/VGW) OTS price $6.60

Goodyear Aircraft Corp., Akron, Ohio.
MODIFICATIONS AND TESTING OF A ONE-PLACE INFLATOPLANE, GA-468.
Final engineering rept.
Sep 61, 1v. incl. illus. (Rept. no. GER-10416)
(Contract Nonr-236800)
Unclassified report

DESCRIPTORS: (*Airplanes, *Liaison planes, Wings, Fuselages, Control surfaces, Pneumatic devices, Design, Flight testing, Wind tunnels, Tests.) (Materials, Textiles, Synthetic rubber, Synthetic fibers.) (Airplanes, Packaging, Handling.) (Airplane engines, Starting, Ignition systems, Magnetos.) (Landing gear, Hydro-skis.) (Pneumatic devices, Pressure.)

Development of the one-place Inflatoplane since the completion of the prototype development program is reported. Tests were conducted on the prototype and ten improved, field evaluation models. Modifications in the evaluation aircraft gave greater strength, improved performance, and increased life and utility. Developments to date indicate the inflatable aircraft is well suited to applications where minimum storage space and weight, air droppability, rapid preparation for flight, excellent short field capability, good flight characteristics, and long range are required. Illustrations show the final aircraft configuration dimensions as well as the plane in its inflated and packaged form. A report of the H36-A engine test and operation is appended. (Author)

AD-266 968 Div. 1, 12, 13
(TIPTB/MS) OTS price $7.60

American Machine and Foundry Co., Niles, Ill.
STORAGE UNIT FOR WASTE MATERIALS.
Rept. on Equipment for Life Support in Aerospace,
by J. D. Zeff, R. B. Neveril and others.
June 61, 64p. incl. illus. tables.
(Contract AF 33(616)6861, Proj. 6373)
(ASD TR 61-200) Unclassified report

DESCRIPTORS: (*Metabolic products, Storage, Storage tanks, Containers, Disposal from Spaceships.) (*Sanitary engineering, Garbage, Processing, Storage, Freeze drying, Space flight, Manned.) *Closed cycle ecological systems.

An engineering evaluation of storage techniques indicated the wastes generated onboard a manned aerospace vehicle are best stored at temperatures above 120 C, in a liquid disinfectant or at temperatures below 0 C. Disposal can be satisfactorily accomplished only by incineration and/or decomposition. No single technique was found which would be suitable for all missions. A freeze drying storage unit is considered best for servicing two crewmembers on a three-day mission, unless wastes can be stored in vacated refrigerated food storage compartments. Tests with a laboratory model of a freeze drying storage unit have shown that wastes can be easily maintained at -20 C and that the evolved gases can be sterilized while passing through a sponge impregnated with disinfectant. The apparent specific volume of the solid wastes was determined to be 11.2 cc/gm. (Author)

AD-266 976 Div. 1
(TIPTA/WAW) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
IN-FLIGHT ENVIRONMENTAL TESTS OF ROCKET CATAPULT MK 1 MOD 0 (AIR CRAFT EJECTION SEAT),
by Howard C. Schafer. Nov 61, 10p. incl. illus. table (Rept. no. NOTS TP 2758)
(NAVWEPS Rept. no. 7777)
Unclassified report

DESCRIPTORS: (Jet fighters, Jet planes, *Attack bombers, Naval aircraft, Ejection seats.) (*Ejection seats, *Catapults, Cockpits, Temperature, Measurement, Flight testing.)

Tests were conducted on the Rocket Catapult Mk 1 Mod 0 (Aircraft Ejection Seat) to ascertain in-flight temperatures to which the unit would be subjected. The catapult units and supplementary instrumentation were installed in live, in-service A4D-2N aircraft, and data were gathered over a one-year period. Results show that the rocket catapult will follow the temperature at which the pilot sets his cabin-conditioning equipment, i.e., 65 to 75 F. (Author)

AD-267 046 Div. 1
(TIPTA/WAW) OTS price $2.50

Research, Inc., Hopkins, Minn.
DESIGN, DEVELOPMENT AND TEST OF A JET AIRCRAFT ARRESTING BARRIER ENGAGEMENT SYSTEM,
by V. H. Larson, R. D. Holmberg and others.
July 61, 101p. incl. illus. tables.
(Contract AF 33(600)37942)
(ASD TR 61-89) Unclassified report

DESCRIPTORS: (*Jet planes, Jet bombers, Jet fighters, Airplane landings, Arresting gear.) (*Arresting gear, Design, Mathematical analysis, Tests, Flight testing, Control systems, Wire, Dynamics, Electronic equipment, Electronic circuits.)

Results are presented of a program for the development of a system to engage a moving aircraft with the cross-runway cable connected to an energy absorbing system. It is designed to engage hook equipped jet aircraft or the landing gear of unmodified jet aircraft in a velocity range of 10 to 200 knots. The cable is ejected from a slot in the runway by release of high pressure air. An electronic control system is utilized so that the release of air and subsequent cable ejection will occur at the proper time and at the correct lateral position. The evolution of the equipment is described from the concept and then the analytical and test phases. Tests were performed at Edwards Air Force Base, California, using F-84G, F-100A, and B-47 aircraft. The system appears feasible and practical. (Author)

AD-267 047 Div. 1, 12
(TIPTA/SEB) OTS price $1.00

MSA Research Corp., Callery, Pa.
ZERO GRAVITY LIQUID OXYGEN CONVERTER.
Rept. on Equipment for Life Support in Aerospace,
by Richard C. Andrews. Sep 61, 27p. incl. illus.
(Contract AF 33(616)6189, Proj. 6373)
(ASD TR 61-431) Unclassified report

DESCRIPTORS: (Spaceships, Satellite vehicles, *Liquefied gases, *Oxygen, Vaporization, Heating, *Control value, Weightlessness, Design, Tests.) (*Oxygen equipment, Design.)

The use of liquid O2 in space vehicles depends upon utilizing a converter that can maintain control of operating pressure and delivery rate under varying gravitational fields including zero gravity. A new converter was designed with an automatically controlled mechanical heat valve for controlling the internal pressure of the flask. The design includes an internal control valve and heat transfer coil to prevent excessive boil off during standby conditions. A prototype zero gravity flask incorporating these features was built and tested. Performance tests showed the heat valve would be effective for controlling heat flow to the flask under various attitudes and gravitational forces. The internal valves leaked across the seat preventing complete shut off. The tests showed the design concepts to be a promising approach for controlling liquid O2 under zero gravity conditions. (Author)

AD-267 053 Div. 1, 14
(TIPTN/BRW) OTS price $8.60

United States Rubber Co., Detroit, Mich.
DEVELOPMENT OF HIGH TEMPERATURE DESIGN CRITERIA FOR AIRCRAFT TIRES.
Rept. for 1 June 58-1 Feb 60,
by R. D. Seeley and W. C. Macklem. July 60, 87p. incl. illus. tables, 23 refs.
(Contract AF 33(616)5711, Proj. 1369)
(WADD TR 60-490) Unclassified report

DESCRIPTORS: (High temperature research, *Aircraft tires, Design, Materials, Elastomers, Silicones, Cordage, Steel wire, Metal plastic adhesives, Plastic flow, Adhesion, Deflection, Loading, Tests, Specifications.) Manufacturing methods, Reinforcing materials, Glass textiles, Synthetic rubber, Heat resistant polymers.

An aircraft tire design, incorporating a radial steel wire rope body in an elastomer matrix was developed capable of performing at aircraft deflections and subjected to limited laboratory tests. Ultimate testing temperature desired was 500 F., however, the actual dynamic testing temperature was 350 F. Silicone was chosen as the most desirable matrix and tread material after studying availability, growth potential, technical state of the art, adhesion to metals, physical properties and processing characteristics. However, the low adhesion, low tensile and poor plastic flow properties necessitated special tire constructions. The current state of development indicates several areas of needed improvement. They include improved hot silicone-steel adhesion, improved sidewall flex cracking resistance, improved hot plastic flow properties, and a modification in wheel and tire design to reduce bead flange chafing. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-266 105 Div. 2, 25
(TIPTP/JW) OTS price $2.60

Puerto Rico U., Mayaguez.
FIXED AZIMUTH SWEEP FREQUENCY BACKSCATTER OBSERVATIONS FROM 27 TO 54 MC/S,
by B. Dueno. 1961, 33p. incl. illus. (Research rept. no. 4)
(Contract AF 49(638)172)
(AFOSR-1573) Unclassified report

DESCRIPTORS: (Particles, Deflection, *Scattering, *Radio signals, *Echo ranging, Azimuth, Ionization.) (Ionospheric disturbances, Transmitter receivers.) (*Wave analysis, High frequency, Radio waves.)

As a result of a fixed azimuth sweep frequency backscatter observations from 27 to 54 mc performed from December 1960 to June 1961, it was found that transequatorial echoes are of two types: (1) simple two hop propagation supported by high density concentrations at geographic latitudes 5 degrees north and 35 degrees south and (2) propagation of low angle rays supported by the decreasing ionization gradient on the far side of the 5 degree latitude concentration and the increasing gradient side of the 35 degree latitude concentration. Also, echoes at F-2 layer heights whose range is independent of frequency were observed frequently in the south direction looking from Puerto Rico. These echoes are explained in terms of high density irregularities imbedded in the F-2 layer having durations from a few minutes to a few hours. These irregularities are more frequent on the lower edge of the layer. (Author)

AD-266 160 Div. 2
(TIPTP/JDP) OTS price $21.00

Quartermaster Research and Engineering Command, Natick, Mass.
SOUTH POLE MICROMETEOROLOGY PROGRAM. PART I. DATA PRESENTATION,
by Paul C. Dalrymple. Oct 61, 388p. incl. illus. tables (Technical rept. no. ES-2)
(In cooperation with Ohio State University Research Foundation; NSF Grant no. Y/21. 13/336)
Unclassified report

DESCRIPTORS: (*Micrometeorology, Antarctic regions.) (*Meteorological data, Temperature, Measurement, Thermocouples, Wind, Anemometers.) (*Meteorological data, Tables.)

Hourly and daily data are presented from the temperature and wind profile studies conducted at the South Pole. A brief text describes the station and its general climatology, the program and instrumentation, the data-reduction system, and the presentation of data. Temperature profiles were measured on 279 days between 3 February and 22 November 1958, and wind profile measurements were taken on 303 days between 1 January and 22 November 1958. Temperatures were measured with very fine gauge copper-constantan thermocouples at 7 depths (-800, -250, -50, -25, -10, -5, and -2 cm), surface, and 9 heights (3, 6, 12, 25, 50, 100, 200, 400, and 800 centimeters). Wind profiles were measured with small plastic 3-cup anemometers at the same heights as the top 6 thermocouples (25 to 800 cm). (Author)

AD-266 170 Div. 2, 8
(TIPTP/GRW) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
A METHOD FOR THE DETERMINATION OF LOWER IONOSPHERE PROPERTIES BY MEANS OF FIELD MEASUREMENTS ON SFERICS.
by F. B. Harris, Jr. Aug 61, 32p. incl. illus.
(Technical rept. no. 1)
(Contract AF 19(604)7369)
(AFCRL-1019) Unclassifed report

DESCRIPTORS: (Ionosphere, *Ionospheric propagation, Wave transmission, *Electromagnetic waves, Propagation.) (*Atmospherics, Atmospheric electricity, Magnetic effects, Determination, Diurnal variations.)

The propagation of audio-frequency and sub-audio-frequency waves between the earth and an ionosphere whose conductivity varies continuously with altitude is considered in detail. The fields are represented in terms of two scalar potentials satisfying appropriate wave equations in spherical coordinates. The wave equations are separable, and the general form of the solutions is discussed. It is shown that waves in this frequency range can be considered to be confined to a thin, but not sharply bounded, spherical shell about the earth. Greatly simplified radial wave equations in dimensionless form are derived incorporating this approximation. Solutions of these equations are given for two regions. An iterative method is presented, based on an integral equation, which makes possible a computation of the radial wave function in the transition region and a joining of interior and exterior solutions for the propagating TM mode. The result is a direct mathematical relationship between the conductivity profile and the complex propagation constant as a function of frequency. (Author)

AD-266 173 Div. 2
(TIPTP/GRW) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
OBJECTIVE STUDY FOR FORECASTING THUNDERSTORMS AT FORT GEORGE G. MEADE, MARYLAND (JUNE, JULY, AUGUST).
5 Sep 61, 10p. incl. illus.
Unclassified report

DESCRIPTORS: (*Weather forecasting, *Storms, Thunder clouds, Maryland.) (Meteorological data, Statistical analysis, Precipitation, Intensity, Abundance.)

AD-266 174 Div. 2
(TIPTP/GRW) OTS price $1.10

Air Weatner Service, Scott Air Force Base, Ill.
AN OBJECTIVE STUDY FOR FORECASTING PRECIPITATION TYPE AT FORT GEORGE G. MEADE, MARYLAND.
7 Sep 61, 10p. incl. illus.
Unclassified report

DESCRIPTORS: (Atmospheric sounding, *Weather forecasting, *Precipitation, *Snow, Maryland.) (Meteorological data, Statistical analysis, Barometric pressure, Temperature.)

AD-266 178 Div. 2
(TIPTP/MFA) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
THE SYSTEM OF SHOCK WAVES GENERATED BY THE FALL AND EXPLOSION OF METEORITES (Sistema Vozdushnykh Udarnykh Voln pri Polete i Vzryve Meteoritov),
by K. P. Stanyukovich, Tr. by Z. Jakubski.
Oct 61, 14p. incl. illus. (Rept. no. STL-TR-61-5110-50; Trans. from Meteoritika. Akademiya Nauk SSSR, 14:62-69, 1956).
Unclassified report

DESCRIPTORS: (*Meteorites, *Shock waves, *Impact shock, Explosions, Falling bodies, Flight paths, Detonation waves, Ballistics, Wave transmission.) (Air, Pressure, Density, Volume, Motion, Velocity.) (Equations, Energy, *Mathematical analysis.)

A mathematical analysis is given of the shock waves propagated by falling and impacting meteorites, Strong shock waves are generated by a meteorite during its fall since its velocity is nearly always above the local speed of sound. Meteorites which reach the earth's surface disintegrate upon impact; a detonation shock wave is then generated progagating from the center of the explosion. This wave may interact with the ballistic shock wave propagated from the trajectory of the fallen meteorite. (Author)

AD-266 194 Div. 2
(TIPTP/GRW) OTS price $8.10

Air Weather Service, Scott Air Force Base, Ill.
TERMINAL FORECAST MANUAL. FOR LAREDO AIR FORCE BASE, TEXAS.
10 May 61, 86p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Air force operations, *Handbooks, *Weather forecasting, *Meteorology, Texas.) (Meteorological data, Landing fields.) (Clouds, Wind, Visibility, Precipitation, Storms.)

Division 2-ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-266 199 Div. 2
(TIPTP/MFA) OTS price $2.60

Uppsala U. (Sweden).
SEISMIC INVESTIGATION OF CRUSTAL STRUCTURE.
Annual technical rept. no. 1, 1 Nov 60-31 Oct 61,
by Markus Bath. 3 Nov 61, 25p.
(Contract DA 91-591-EUC-1637)
(ARPA Order no. 165-61)
Unclassified report

DESCRIPTORS: (*Earth, Structures, Velocity, Seismic waves in Iceland, Sweden, Denmark, Finland.) (Geophysics, Measurement, *Geology, Rock, Granite, Sedimentation.) (Earthquakes, Wave transmission, Refraction, Explosions.)

The structural relation between Iceland and the surrounding ocean, especially the Mid-Atlantic Ridge, was investigated by means of group-velocity dispersion curves for Love and Rayleigh waves from earthquakes in the region. (Author)

AD-266 264 Div. 2
(TIPTP/MFA) OTS price $8.60

Beach Erosion Board, Corps of Engineers, Washington, D. C.
GEOMORPHOLOGY OF THE SOUTH SHORE OF LONG ISLAND, NEW YORK,
by Norman E. Taney. Sep 61, 94p. incl. illus. tables (Technical memo. no. 128)
Unclassified report

DESCRIPTORS: (*Geology, Terrain, *Beaches, *New York, Mapping, Rock, Sedimentation, Geological survey.) (*Tables, Data.) *Bibliography.

The geologic factors which influenced the development of the south shore of Long Island to data are treated in broad scope. Interpretation of geologic events are drawn from the works of many authors, and a history of shore line changes and inlet migration is compiled from available USC&GS and Corps of Engineers survey data. Graphic presentation of the shore line history is included. Littoral transport rates are estimated. All readily available survey data and comparative volumetric changes therefrom are tabulated in appendices. (Author)

AD-266 285 Div. 2, 3
(TIPTP/GRW) OTS price $3.60

Johann Wolfgang Goethe U. (Germany).
THE CHEMICAL COMPOSITION OF INDIVIDUAL RAINFALLS,
by Hans-Walter Georgii and Erich Weber. July 60, 27p. illus. 19 refs.
(Contract AF 61(052)249)
(AFCRL TN 60-827)
Unclassified report

DESCRIPTORS: (Atmosphere, *Precipitation, Chemical analysis, *Tracer studies, Germany.) (Raindrops, Intensity, Contamination, Aerosols, Particles.)

The chemical composition of individual cases of rainfall was analyzed at three different sampling stations. The locations showed a great variety with respect to altitude, climate and level of industrial and anthropogeneous pollution. A relation between the concentration of trace substances in rainwater and the quantity of rain was found which obeys a power law. The amount of trace substances in rainwater shows a marked increase after a preceding period of dry days. Changes of the concentration of atmospheric aerosols and trace gases caused by the effect of precipitation are described. (Author)

AD-266 323 Div. 2, 25
(TIPTP/MFA) OTS price $2.60

Microwave Lab., Stanford U., Calif.
ON THE THERMAL GENERATION OF TOROIDAL MAGNETIC FIELDS IN ROTATING STARS.
Technical note,
by L. Mestel and I. W. Roxburgh. Aug 61, 22p.
(ML rept. no. 837; Stanford Radio Astronomy Inst. Pub. no. 18)
(Contract AF 49(638)342)
(AFOSR-1386) Unclassified report

DESCRIPTORS: (*Stars, Radio astronomy, *Magnetic fields, Electric fields, Torque, Interstellar matter, Electrons, Hydrostatic pressure, Hall effect, Stability, Thermal radiation, Magnetohydrodynamics.) (Equations, Motion, Integrals.)

Biermann (Zeitschrift fur Naturforschung, 5a, 65(1950)) has shown that, in a rotating star without any initial magnetic field, the electron partial pressure slowly generates a toroidal magnetic field of considerable strength. The problem is here reconsidered, assuming the star to have a primeval magnetic field, with its poloidal component very much weaker than the toroidal field predicted by Biermann. It is shown that the interaction of the magnetic torque and the rotation field is sufficient to ensure that the electron pressure has negligible effect, whether or not there is meridian circulation of matter inside the star. (Author)

AD-266 420 Div. 2
(TIPTP/GRW) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
A REVISION TO EXISTING OBJECTIVE TECHNIQUES FOR FORECASTING IFR CONDITIONS AT DULUTH AIR FORCE BASE, MINNESOTA, OCTOBER 1960,
by Thomas H. Simmonds. Oct 60, 11p. illus.
Unclassified report

DESCRIPTORS: (*Weather forecasting, *Visibility, Landing fields, Air force operations, Minnesota.) (Meteorological data, Haze, Clouds, Fog, Wind.)

AD-266 458 Div. 2
(TIPTB/MS) OTS price $8.10

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
PLANETARY ATMOSPHERES AND RELATED INFORMATION: A BIBLIOGRAPHY,
by E. Colabrese. Oct 61, 78p. 508 refs. (Rept. no. R61SD126)
Unclassified report

DESCRIPTORS: (*Planetary atmospheres, *Bibliography.) (*Planets, Surface properties, Temperature, Physical properties, Measurement.) (Saturn, Mars, Venus, Moon.)

Although the composition of the planetary atmospheres is the prime concern of this bibliography, articles and reports on other aspects of the planets, such as surface features, temperature

properties and radiation measurements were included. Section I contains 169 references on the Planetary System in general; Section II 159 references on Mars; Section III 90 references on Venus; Section IV 49 references on Jupiter; Section V 15 references on Saturn; and Section VI 23 references on Interplanetary Space & Exploration. Approximately one fourth of the references are abstracted. Abstracts were obtained from the sources consulted in compiling the bibliography. Within each of the six sections, references are arranged alphabetically by author. (Author)

AD-266 474 Div. 2
(TIPTP/JDP) OTS price $1.60

Yamaguchi U. (Japan).
SUNSPOT-CLIMATIC RELATIONSHIPS IN FLUCTUATIONS OF GLACIERS IN THE ALPS AND ATMOSPHERIC PRECIPITATION IN KOREA,
by Takeo Yamamoto. Mar 61, 10p. illus. tables. (Rept. no. 61-210)
Unclassified report

DESCRIPTORS: (Sunspots, Climatic factors, *Glaciers, Mountains, Europe.) *Precipitation, Atmosphere, Korea, Diurnal variations.)

An attempt is made to examine the sunspot-climate relationship on the basis of long-term variations of climate in Europe and Asia which have been recorded continuously for more than two centuries. (Author)

AD-266 475 Div. 2
(TIPTP/MFA) OTS price $14.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE EVALUATION OF DEPOSITS IN PROSPECTING AND EXPLORING, SIXTEENTH EDITION (Otsenka Mestorozhdeniy Pri Poiskakh I Razvedkakh, Issue 16),
by N. S. Lavrovich. 1961, 201p. incl. illus. tables (Trans. no. MCL-273 of Vsesoyuznyy Nauchno-Issledovatel'skiy Institut Mineral'nogo Syr'ya Ministerstva Geologii i Okhrany Nedr, SSSR, 136p., 1956)
Unclassified report

DESCRIPTORS: (Textbooks or Scientific reports, Translations, USSR.) (Mining engineering, *Minerals, *Exploration, *Fluorspar.) (*Processing, Physical properties, Chemical properties.) (Industry, Metallurgy, Ceramic materials, Glass, Cements.) (*Geology, Economics.) *Bibliography.

Information is presented on the geology, mineralogy, and economic geology of fluorspar deposits in the U.S.S.R. A discussion of the chemical and physical properties along with the numerous industrial applications for this mineral are given. Mining problems, geologic conditions and production figures are listed. An extensive Russian literature bibliography is appended.

AD-266 478 Div. 2, 12
(TIPTA/SEB) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ON THE WAY TO THE VENUS (Na Puti k Venere),
by V. Demin. 22 Sep 61, 6p. incl. illus. (Trans. no. MCL-1261 of Krasnaya Svezda, 56 (11356) p. 4, 7 Mar 61)
Unclassified report

DESCRIPTORS: (*Venus, Astronomy, Astronomical data.) (Space flight, *Satellite vehicle trajectories, Design, Errors.) (Technological Intelligence, Translations, USSR.)

A method for measuring interplanetary distances based on Kepler's law is discussed with particular reference to forming satellite trajectories for a flight to Venus.

AD-266 481 Div. 2, 25
(TIPTB/JDP) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
ATMOSPHERE OF MARS. REVIEW OF SOVIET LITERATURE. Chapter no. 3 of a Study of Soviet Research on the Atmospheres of Venus, Mars, and the Moon.
31 Oct 61, 31p. incl. illus. tables, 25 refs. (AID rept. 61-138)
Unclassified report

DESCRIPTORS: (*Mars, *Planetary atmospheres, Literature, Translations, USSR.) (*Astrophysics, *Planetary atmospheres, Optics, Photographic analysis, Spectrographic analysis, Planets, Scientific research, USSR.)

Soviet findings and opinions are reviewed on the nature of the Martian atmosphere as based upon visual, photographic, and spectroscopic studies, antecedent to the launching of a rocket probe. The report is based on materials available at the Library of Congress. (Author)

AD-266 488 Div. 2
(TIPTP/GRW) OTS price $2.60

Air Weather Service, Scott Air Force Base, Ill.
CEILING AND VISIBILITY STUDY FOR MOODY AFB.
Oct 60, 4p. illus. tables.
Unclassified report

DESCRIPTORS: (*Weather forecasting, *Fog, *Stratus clouds, *Visibility, Landing fields, Georgia.) (Air force operations, Clouds, Height finding, Climatic factors.)

The analysis investigates fog and stratus during the months of November through March. Ten months of data from the years 1957, 1958 and 1959 were used. Three operational categories were used as criteria for development of this objective technique. The categories are: (1) Below Minimums: ceiling less than two hundred feet and visibility less than one-half mile; (2) IFR: ceiling less than fifteen hundred feet but not less than two hundred feet and visibility less than three miles but not less than one-half mile; and (3) VFR: ceiling fifteen hundred feet or greater and visibility three miles or greater. A consolidation of the scattergrams is tabulated. (Author)

AD-266 508 Div. 2, 33
(TIPTP/GRW) OTS price $11.50

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TRAFFICABILITY OF SNOW. TESTS ON SUBARCTIC SNOW.

by C. A. Blackmon and A. A. Rula. Dec 60, 46p. incl. illus. tables (Technical memo. no. 3-414; rept. no. 4)
Unclassified report

DESCRIPTORS: (Tables, *Snow, Trafficability, *Mechanical properties, Classification.) (*Snow vehicles, Tests, Colorado, Manitoba, Michigan, Ontario.)

A total of 39 self-propelled tests were run with tracked and wheeled vehicles. In addition, a detailed test program consisting of 27 self-propelled, 24 towing, and 8 towed tests was conducted with tracked vehicles. The principal conclusion of the tests was that depth of the snowpack appears to be the most important factor affecting trafficability of subarctic snow. It is estimated that conventional wheeled vehicles would not negotiate snow deeper than about 25 per cent of the wheel diameter. Snow depth is correlated with vehicle-performance parameters such as rut depth and maximum drawbar pull. It was found that (a) ground-contact pressure is the most important vehicle characteristic affecting vehicle performance, and (b) drawbar pull is greater in moist than in dry snow for snowpacks of the same depth and strength. (Author)

AD-266 517 Div. 2
(TIPTP/MFA) OTS price $2.60

Geophysical Inst., U. of Alaska, College.
ASYMMETRY OF DST VARIATIONS OF GEOMAGNETIC STORMS WITH RESPECT TO THE GEOMAGNETIC EQUATOR,
by Masahisa Sugiura. Aug 61, 12p. illus. tables. (Scientific rept. no. 3; UAG-R122)
(Contract AF 19(604)2163)
(AFCRL-1012) Unclassified report

DESCRIPTORS: (Geophysics, *Terrestrial magnetism, *Storms, Measurement, Diurnal variations, Aurorae.) (Data, Tables.)

The seasonal variations in the Dst part of magnetic storms are determined for three pairs of stations, each pair consisting of two stations at nearly equal geomagnetic latitudes in the northern and southern hemispheres. The results show that in solstitial seasons the Dst field is not symmetrical with respect to the geomagnetic equator. The asymmetry is small in low latitudes and increases toward the auroral zones. Dm has a similar asymmetry with respect to the equator. These characteristics of Dst and Dm are interpreted as due to the asymmetry of auroral electrojets with respect to the geomagnetic equator in solstitial seasons. (Author)

AD-266 518 Div. 2
(TIPTP/GRW) OTS price $1.60

Geophysical Inst., U. of Alaska, College.
HIGH LATITUDE GEOPHYSICAL DATA FOR JULY 1961.
1 Oct 61, 5p. tables (Rept. no. UAG-C23)
Unclassified report

DESCRIPTORS: (*Geophysics, Alaska.) (Earth, Electric currents, Terrestrial magnetism.) (Cosmic rays, Noise (Radio), Ionospheric disturbances, Aurorae, Tables, Diurnal variations.)

Contents:
Earth current amplitude activity
Earth current fluctuations
Ionospheric absorption of cosmic radio noise
Auroral radar activity indices for January-July 1961
College K-indices, whole-day character, and equivalent daily amplitude

AD-266 592 Div. 2, 6, 25
(TIPTP/JW) OTS price $5.60

Narragansett Marine Lab., U. of Rhode Island, Kingston.
PRELIMINARY STUDY OF LOW FREQUENCY SHALLOW WATER AMBIENT NOISE IN NARRAGANSETT BAY, R. I.,
by Jack Willis and Frank T. Dietz. Nov 61, 53p. incl. illus. tables, 43 refs. (Ref. no. 61-4; Technical rept. no. 6)
(Contract Nonr-39604, Proj. NR 385-205)
Unclassified report

DESCRIPTORS: (*Underwater sound, Noise, Diurnal variations, Tides, Wind, Water waves.) (Sound ranging, Narragansett Bay, *Oceanography, Noise.) (*Ocean waves, Noise generators.) (*Acoustics, Underwater and transmission.)

Continuous recordings of the shallow water 25 cps octave vertical noise component and certain environmental variables were obtained every other day during the month of March, 1961. The analysis of these data shows that significant associations exist between noise and tidal slope, wind speed, and wave height. In addition, when the noise level data are averaged according to the hour of the observation, a cyclicity is evident which has a twelve-hour period and is phased so that the noise peaks are positioned at approximately noon and midnight. A twelve-hour cyclicity is also apparent for the hourly averages of the tidal level, but not the tidal slope. Cyclicity of the tidal level averages suggests that the cyclic noise variation is the result of tidal influences. Lack of cyclicity in the tidal slope averages contradicts this explanation and favors the belief that the noise level in this frequency band may be displaying a diurnal variation comforming with a similar result first reported by Wenz and Linnette in November, 1960. Because of the strong tidal influence on noise in this octave, it was not possible to either accept or reject the hypothesis of a diurnal noise variation. (Author)

AD-266 666 Div. 2, 25
(TIPTP/WH) OTS price $8.60

Stanford Research Inst., Menlo Park, Calif.
THERMALLY DRIVEN, AXIALLY SYMMETRIC CIRCULATIONS OF A PLANETARY ATMOSPHERE. A DYNAMICAL-NUMERICAL EXPERIMENT,
by Manfred M. Holl. Sep 61, 90p. incl. illus. tables (Scientific rept. no. 3)
(Contract AF 19(604)5965)
(ARPA Order no. 26-59)
(AFCRL-1017) Unclassified report

DESCRIPTORS: (*Planetary atmospheres, Motion, Heat, Thermodynamics.) (Thermodynamics, Gases, *Astrophysics.) (Planetary atmospheres, Circulatory systems.)

A dynamical-numerical experiment is designed to envolve thermally-driven circulations, symmetric about the polar axis, in the region from equator to pole. The selection of variables and transformations of the hydrostatic equation system (primitive equations) and the development of the numerical analogue are discussed in some detail. The region is discretized into volume modules by 19 levels in the vertical and by 49 equal intervals from equator to pole. The upper boundary is essentially unrestricted. Mass and absolute angular momentum are treated conservatively and in terms of fluxes across module interfaces. Heating rate distributions are prescribed in space and are stepwise introduced to disturb an

atmosphere at relative rest or in balanced zonal motion. The fields are portrayed in a representative meridional plane. Pertinent numerical analyses are included and compression-gravity oscillations are analyzed. (Author)

AD-266 677 Div. 2
(TIPTP/GRW) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE AID FOR FORECASTING STRONG AND GUSTY SURFACE WINDS AT TRAVIS AFB, CALIFORNIA.
Rev., Oct 61, 3p. incl. illus.
Unclassified report

DESCRIPTORS: (Military intelligence, *Weather forecasting, Wind, *Gusts.) (Terrain, Surface properties, California, Test methods, Statistical analysis.)

AD-266 678 Div. 2
(TIPTP/GRW) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE TECHNIQUE FOR FORECASTING STRATUS AND FOG AT DET 1, 24TH WEATHER SQUADRON, AMARILLO AIR FORCE BASE, TEXAS,
by John M. Huck. Aug 61, 22p. incl. illus. (Rept. no. 4003)
Unclassified report

DESCRIPTORS: (*Weather forecasting, *Stratus clouds, *Fog, Texas.) (Air force operations, Visibility, Air mass analysis, Wind direction indicators.)

AD-266 679 Div. 2
(TIPTP/GRW) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE TECHNIQUE FOR FORECASTING STRONG AND GUSTY SURFACE WINDS AT DET 1, 24TH WEATHER SQUADRON, AMARILLO AIR FORCE BASE, TEXAS.
Study based on AWS TR 105-149,
by Thomas H. Simmonds, rev. by John M. Huck.
Dec 60, 6p. illus. (Rept. no. 4002)
Unclassified report

DESCRIPTORS: (*Weather forecasting, *Gusts, Wind, *Dust storms, Landing fields, Texas.) (Test methods, Meteorological data, Statistical analysis, Periodic variations.)

AD-266 680 Div. 2
(TIPTP/GRW) OTS price $8.60

Laboratory of Climatology, C. W. Thornthwaite Associates, Centerton, N. J.
THE CLIMATIC WATER BALANCE,
by John R. Mather. 1961, 94p. incl. illus. tables (Technical note no. 1)
(Contract AF 49(638)887, Proj. 9774)
(AFOSR-1637) Unclassified report

DESCRIPTORS: (*Atmosphere, *Moisture, Determination, Diurnal variations, Periodic variations.) (Evapotranspiration, *Climatic factors, Soils, Precipitation, Drainage.) (Data processing systems, Digital computers.) Punched card methods.

This document includes:
INSTRUCTIONS FOR USE OF THE IBM 602A CALCULATOR FOR DAILY SOIL MOISTURE ACCOUNTING, by Ray F. Pengra. 1961, 22p. incl. illus. tables (Technical note no. 1)
MANUAL FOR USE OF THE IBM 650 CALCULATOR FOR COMPUTING POTENTIAL EVAPOTRANSPIRATION AND THE WATER BALANCE, by Howard H. Engelbrecht. 1961, 16p. incl. tables (Technical note no. 1)

The Thornthwaite climatic water balance provides a realistic way to evaluate the moisture factor in climate. By means of the water balance bookkeeping procedure, using the data of air temperature, precipitation, and location, it is possible to determine either on a monthly or a daily basis the periods and amounts of the water surplus, water deficit, soil moisture storage, and the runoff of water. The method of computation of the climatic factor, potential evapotranspiration, and its use in either the daily or monthly water balance procedures was discussed in detail in previous issues of publications in Climatology. High speed computers have been used to apply the daily Thornthwaite climatic water balance bookkeeping procedure to the solution of moisture problems. (Author)

AD-266 766 Div. 2
(TIPTP/JDP) OTS price $10.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
QUESTIONS OF CLOUD PHYSICS AND ACTIVE MODIFICATIONS,
by N. S. Shishkin. 2 Nov 61, 131p. incl. illus. tables (Trans. no. MCL-1340 of Trudy Glavnoy Geofizicheskoy Observatorii im. A. I. Voyeykova 104:3-95, 1960)
Unclassified report

DESCRIPTORS: (*Clouds, Convection, Translations, USSR.) (*Meteorological data, Atmospheric sounding, Precipitation, Microstructure, Cumulus clouds, Water, Fog.)

Contents:
Calculating the rate of vertical development of convective clouds
The amount and intensity of precipitation from convective clouds
Changes in the microstructure of convective clouds during the fall of precipitation
Data on the crystallization temperature of the tops of cumulus congestus clouds in various physicogeographic regions
Certain features of the solid phase of water in the atmosphere at low negative air temperatures
Sounding of the atmosphere using the TU-104 airplane
The study of the water resources of clouds of the warm half-year in the lake Sevan basin
The use of colloidal solutions for the seeding of supercooled clouds and fog
Results of laboratory experiments on the ice-forming activity of certain substances in supercooled fog
The influence of the frequency and intensity of acoustic vibrations on the rate of dissipation of fog

AD-266 782 Div. 2, 33
(TIPTB/JAB) OTS price $8.10

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
FIELD MOISTURE CONTENT INVESTIGATION - NOVEMBER

1952-MAY 1956 PHASE,
by L. M. Womack, M. J. Mathews, and Z. B. Fry. May 61, 22p. illus. tables (Technical memo. no. 3-401, rept. no. 3)
Unclassified report

DESCRIPTORS: (*Landing fields, *Runways, *Moisture, Soils, Climatic factors, Determination.) Pavements.

Tests were conducted on base course and subgrade materials at Kirtland AFB, Albuquerque, N. Mex., Sewart AFB, Nashville, Tenn., and Craig AFB, Selma, Ala., located in different climatic regions, to determine the variation in moisture content with time, and the movement and source of moisture beneath airfield pavements. The variation in moisture content with time (all elevations) followed no prescribed pattern of increase or decrease. The 18-in. depth in the subgrade was the only elevation to produce a trend of higher moisture content in the high rainfall zone. The variation (movement) of moisture content across the pavement width was insignificant in the base course and inconsistent for the two elevations in the subgrade. In-place moisture contents varied directly with the soil's plastic limit, liquid limit, plasticity index, optimum moisture content, and percentage of material passing the No. 200 sieve. The variation in moisture content could not be directly related to rainfall zone or climatic region, nor was the source of the moisture definitely determined for the areas tested. (Author)

AD-266 785 Div. 2, 22
(TIPTW/RD) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AEROBEE USN ND 3.112 (AF-72).
Meteorological Data rept.
Aug 61, 24p. incl. tables.
Unclassified report

DESCRIPTORS: (*Sounding rockets, Launching, Exterior ballistics, Landing impact.) (*Landing impact of Mathematical prediction for Meteorological data.) Tables.

Meteorological data gathered for the launching of Aerobee USN ND 3.112 (AF-72) are presented for the U.S. Naval Research Laboratory and for ballistic studies. The data appear, with calculated ballistic data, in appendices. (Author)

AD-266 786 Div. 2, 22
(TIPTP/GRW) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
AEROBEE NO 3.102 (NRL-68).
Meteorological data rept.
by G. L. Dunaway. July 61, 26p. incl. tables.
Unclassified report

DESCRIPTORS: (*Meteorological data, Collecting methods by Meteorological balloons for *Sounding rockets, *Ballistics.) (Launching, Terminal ballistics, Climatic factors, Tables, Landing impact, Corrections.)

Meteorological data gathered for the launching of Aerobee NE 3.102 (NRL-68) are presented for ballistic studies. The meteorological data appear with calculated ballistic data. (Author)

AD-266 790 Div. 2
(TIPTP/MFA) OTS price $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
RADIATION FROM PLANET EARTH,
by I. L. Goldberg. Sep 61, 36p. incl. illus. tables (Technical rept. no. 2231)
Unclassified report

DESCRIPTORS: (*Thermal radiation from Electromagnetic waves, *Earth, Solar energy, Solar spectrum.) (*Heat transfer, Energy, Albedo, Thermal insulation, Infrared radiation, Reflection, Ultraviolet radiation.) (Reflectometers, Bolometers.) (Experimental data, Equations, Integration.)

Information is given on the part played by the sun, earth's surface, and atmosphere in the heat balance of our planet. Following a general survey of solar and terrestrial radiation, including the emissivity and reflectivity of various terrestrial features (clouds, land masses, oceans), an estimate is made of the planetary radiation received by a satellite radiometer in five spectral channels covering the ultraviolet, visible, and infrared spectral regions. The wavelengths and purpose for selecting each of the channels is given. The signal-to-noise ratios associated with the received radiation in each channel using bolometers such as those in TIROS II and III, are included. (Author)

AD-266 802 Div. 2
(TIPTP/GRW) OTS price $11.00

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
TEMPERATURE VARIATIONS IN THE FIRST 200 FEET OF THE ATMOSPHERE IN AN ARID REGION.
Data rept.,
by Patsy Sue Carnes. July 61, 138p. incl. illus.
Unclassified report

DESCRIPTORS: (*Atmosphere, Temperature, *Temperature charts, Deserts, New Mexico, Diurnal variations.) (Recording devices, Meteorological instruments, Towers, *Micrometeorology.)

Temperature variations in the first 200 ft of the atmosphere as observed in the Tularosa Basin of New Mexico are presented for the period January 1958 through April 1960. The information was compiled from records collected at the U. S. Army Signal Missile Support Agency's Missile Meteorology Research Tower at White Sands Missile Range, New Mexico. (Author)

AD-266 808 Div. 2, 25
(TIPTP/MFA) OTS price $1.60

Maryland U., College Park.
DENSITY OF A NEUTRAL EXOSPHERE DERIVED FROM THE BOLTZMANN EQUATION,
by M. Fibich and F. Singer. Oct 61, 10p. illus.
(Technical rept. no. 230)
(Contract AF 19(604)3861)
(AFCRL-1038) Unclassified report

DESCRIPTORS: (*Exosphere, *Density, *Planets.) (Boundary layer, Energy, Motion, Particles, Velocity.) (Equations, Integral transforms, Perturbation theory.)

It is shown that the density of a planetary

exosphere can be derived from the Boltzmann equation, provided the equation is modified to take into account the escape component. The solution is obtained through a perturbation method; the zeroth order solution is the barometric formula, which applies when escape is negligible. The solution gives only the total density (ballistic plus bound orbits). (Author)

AD-266 885 Div. 2
(TIPTP/GRW) OTS price $1.60

Marine Lab., U. of Miami, Coral Gables, Fla.
BATHYMETRIC RECONNAISSANCE OF EXUMA SOUND,
by Violet B. Siegler. Sep 61, 9p. illus. (Rept. no. ML 61300; Rept. no. 61-4)
(Contract Nonr-84001)
Unclassified report

DESCRIPTORS: (Atlantic Ocean, Bahama islands, *Echo ranging, *Ocean bottom, *Depth indicators, Bathythermograph data, Oceanographical charts.)

A bathymetric survey was undertaken with an expanded scale Precision Depth Recorder in Exuma Sound which is the easternmost trough cut in the shallow, flat, calcareous Bahama Banks. Comparisons with the Tongue of the Ocean and the Straits of Florida were made and it was attempted to discover a structural pattern for the area and how this pattern evolved. Exuma Sound resembles the other two features, all three are deeply incised on the Florida Borderland, each with a flat bottom and steep sides which in this case reach a maximum slope of nearly 30%. (Author)

AD-266 886 Div. 2
(TIPTP/GRW) OTS price $9.10

Marine Lab., U. of Miami, Coral Gables, Fla.
A REPORT OF DATA OBTAINED IN FLORIDA STRAITS AND OFF THE WEST COAST OF FLORIDA, JULY-DECEMBER 1960.
Sep 61, 109p. incl. illus. tables (Rept. no. ML 61296; Rept. no. 61-3)
(Contract Nonr-84001)
Unclassified report

DESCRIPTORS: (Tables, *Oceanographical data, Florida straits, Gulf of Mexico.) (Sea water, Sampling, Salinity, Bathythermograph data.) (Ocean currents, Temperature, Depth indicators.)

Data were obtained on four cruises of R/V GERDA in Florida Straits and the eastern part of the Gulf of Mexico during the latter half of 1960. The general purpose of the cruises was to provide data for the study of (a) the kinematics of the water movements in Florida Straits and adjacent waters, with special regard to seasonal variations; and (b) the physical environment of organisms, especially the shrimp population inhabiting Florida Bay. The itineraries followed are shown in charts immediately preceding the list of data relating to a particular cruise. (Author)

AD-266 916 Div. 2
(TIPTP/MFA) OTS price $2.60

Geophysical Inst., U. of Alaska, College.
A STUDY OF THE MORPHOLOGY OF GEOMAGNETIC STORMS.
Final rept.,
by Masahisa Sugiura. Oct 61, 22p. (Rept. no. UAG-R 125)
(Contract AF 19(604)2163)
(AFCRL-1029) Unclassified report

DESCRIPTORS: (*Storms, *Terrestrial magnetism, Astronomical observatories, Magnetic fields, Solar disturbances, Earth, Surface properties, Thermal radiation.) (Astronomical data, Harmonic analysis, Statistical analysis.)

The average morphology of magnetic storms with sudden commencement was studied with 346 magnetic storms that occurred in the years 1902 to 1945. Magnetic records from 26 observatories were used. The 346 storms were classed into three intensity groups of great, moderate and weak storms, and their morphology was investigated separately. The storm variation was analyzed into two parts, Dst and DS. DS was analyzed harmonically, and its changes with storm time were studied in great detail. The author's present views on storm sudden commencements and on the abnormal nature of the storm variations at the geomagnetic equator are briefly reviewed. (Author)

AD-266 917 Div. 2
(TIPTP/MFA) OTS price $1.60

Geophysical Inst., U. of Alaska, College.
A NOTE ON THE DS VARIATION OF GEOMAGNETIC STORMS: A CRITICAL EXAMINATION OF METHOD OF ANALYSIS,
by Masahisa Sugiura. Sep 61, 10p. incl. illus. (Scientific rept. no. 4; Rept. no. UAG-R 123)
(Contract AF 19(604)2163)
(AFCRL-1013) Unclassified report

DESCRIPTORS: (*Storms, *Terrestrial magnetism, Magnetic fields, Solar disturbances, Astronomical data, Harmonic analysis.)

The determination of DS variation of magnetic storms as a function of storm time is critically examined. The regular changes in the phase angles of harmonics for DS (Memoirs Kakioka Magnetic Observatory, 8, No. 2:13-32, 1958) are attributed to irregular features that are not adequately averaged out. This apparently paradoxical circumstance is explained with an illustrative example. (Author)

AD-266 948 Div. 2, 25
(TIPTP/GRW) OTS price $4.60

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
REPORT ON RAW DATA OF THE BALLOON FLIGHT OF AUGUST 21-22, 1961,
by Robert C. White. 1961, 44p. incl. illus.
(Contract AF 19(604)7490)
Unclassified report

DESCRIPTORS: (*Meteorological balloons, Flight paths, *Galvanometers, Photographic film.) (Meteorological data, *Spectrographic data, Recording devices, Photographic recording systems.)

The photographic record of three galvanometer deflections is reproduced following the trajectory and profile of the flight. The diffraction grating spectrum fell on three exit slits which were imaged on three thermopile receivers connected to the three galvanometers. The three spectral bands were filtered with order sorters. Approximate altitudes, and the wavelengths for the first order spectrum are given below the reproduced film strips. (Author)

Division 3-CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-266 994 Div. 2, 25
(TIPTP/JW) OTS price $5.60

Washington U., Seattle.
(No title).
Annual summary rept., 1 Dec 60-1 Dec 61.
1 Dec 61, 56p. incl. illus.
(Contract Nonr-47724, Proj. NR 307-252)
Unclassified report

DESCRIPTORS: (Sea water, Ice, Crystals, *Ice islands.) (*Weather forecasting, Meteorological data, Weather communications.) (Energy, *Meteorology, Weather stations, Micrometeorology.) Arctic regions.

Contents:
A spectral analysis of energy changes and energy conversions during the sudden warmings of January 1957 and 1958, by R. J. Reed, J. L. Wolfe and H. Nishimoto
Ice crystal studies - final report, by C. Knight

AD-267 088 Div. 2, 6, 16, 28
(TIPTP/TL) OTS price $3.60

Institute of Sciences and Tech., U. of Michigan, Ann Arbor.
SCINTILLATION AND VISUAL RESOLUTION OVER THE GROUND. 1959 EXPERIMENTS.
Rept. on Proj. Michigan,
by F. R. Bellaire and E. Ryznar. Sep 61, 28p. incl. illus. tables (Rept. no. 2900-293-T)
(Contract DA 36-039-sc-78801)
Unclassified report

DESCRIPTORS: (Visibility, Optics, Terrain, *Meteorology, Climatic factors.) (Density, *Visual perception, Atmosphere, Motion, Light, Optical instruments, Tests, Refraction, Temperature.) (Wind, Velocity, Measurement.)

Scintillation is generally regarded as the limiting factor in the ultimate resolution obtainable with optical surveillance devices in seeing distant objects. Its effects on the performance of optical sensors are most pronounced when the atmosphere is clear, a time when visual range would be otherwise unimpeded. Field experiments were conducted to determine the relationship between scintillation over level ground and various meteorological parameters under the conditions of a fixed and also a variable optical path. The experimental site on the Willow Run Airport was the same as that in the 1958 experiments. Results and conclusions are presented concerning the effect of the temperature profile, the wind velocity, the amount of cloudiness, and the length and orientation of the light path on scintillation. Scintillation depends systematically upon the absolute magnitude of the vertical temperature profile and the vertical motions within the ground layers of the atmosphere. Scintillation decreases with increasing cloudiness, increases nearly linearly with increasing path length, and is higher looking crosswind than up/downwind. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-266 213 Div. 3
(TIPTW/JRG) OTS price $1.00

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
SEA-LEVEL AND HIGH-ALTITUDE PERFORMANCE OF EXPERIMENTAL PHOTOFLASH COMPOSITIONS,
by Seymour Lopatin. Oct 61, 31p. incl. tables.
(Technical rept. no. FRL-TR 29)
Unclassified report

DESCRIPTORS: (*Photoflash cartridges, *Pyrotechnics, *Materials, High altitude, Tests.) (Photoflash cartridges, Pyrotechnics, Materials, High altitude, Tests, Alkaline earth compounds, Calcium compounds, Strontium compounds, Barium compounds, Alkali metal compounds, Sodium compounds, Silicon, Potassium compounds, Lithium compounds, Perchlorates.) (Nitrates, Oxides, Fluorides, Aluminum, Magnesium, Zirconium, Titanium, Boron, Alloys, Powder metals.)

Ca/Mg and Ca/Al alloys are satisfactory substitutes for Cal metal powder as highly efficient fuels for high-altitude photoflash items. When tested under pressures simulating a 100,000-ft altitude, these alloys gave greater light output than at sea level. This phenomenon can also be obtained with compositions containing Cal salts which are oxidants or additives. Test results indicated that Ca is necessary for the production of superior high-altitude flashes. The alkaline earth perchlorates were found to be better oxidants than the alkali metal perchlorates. Of the alkaline perchlorates evaluated (Ca, Sr, and Ba), the Ca compound was optimum at both sea level and high altitude. Na perchlorate was optimum at high altitude among the alkali perchlorates investigated (Na, K, and Li). Substituting alkaline earth perchlorates for their respective nitrates considerably improved light output at both sea level and high altitude. Substituting Ba perchlorate for Ba nitrate also improved the ignitability of the composition. (Author)

AD-266 272 Div. 3, 1
(TIPTW/JRG) OTS price $2.60

Emerson Electric Mfg. Co., St. Louis, Mo.
STRUCTURAL TEST UNDER LABORATORY CONDITIONS FOR THE AERO 5A-1 FLARE LAUNCHER, AIRBORNE.
29 Sep 61, 25p. incl. illus. tables (Rept. no. 1228)
(Subcontract to Universal Match Corp., St. Louis, Mo.; Contract NOw 61-0514-c)
Unclassified report

DESCRIPTORS: (*Aircraft flares, *Pyrotechnic ejectors, Structures, Tests.)

Structural tests of the Aero 5A-1 flare launcher were successfully completed. No permanent deformation was noted at limit loads and no failures occurred. (Author)

AD-266 334 Div. 3, 10, 27
(TIPTM/EJH) OTS price $4.60

Reaction Motors Div., Thiokol Chemical Corp., Denville, N. J.
PRESSURIZATION-THRUST RELATIONSHIPS OF VISCOELASTIC FLUIDS.
Final rept.,
by B. Dawson, D. Schmidt and others. 1961, 46p. incl. illus. tables (Rept. no. 2068-F)
(Contract DA 18-108-405-cml-891)
Unclassified report

DESCRIPTORS: (*Flame throwers, Guns, *Flame thrower fuels, Rocket fuels, Rocket propellants, Propellants, Rocket oxidizers, Design.) (*Recoil mechanisms, *Gas generating systems,

Gasoline, Gels.) (Combustion chamber gases, Liquid rocket propellants, Hydrazines, Methyl hydrazines, Nitrogen compounds, Tetroxides.) (Rocket motors, Thrust, Specific impulse.) Feasibility studies.

A study was made of the feasibility of developing a portable flamethrower with a range in excess of 100 yd, and possibly as great as 150 yards. Investigation of basic factors has shown that it will be necessary to use gun nozzles of a size which heretofore have been used only in vehicle-borne flamethrowers. After feasibility has been demonstrated, the experimental apparatus can be used to determine values for various important design parameters, and to determine tolerances for these parameter values. When completed, the experimental apparatus will have two novel features (1) a small retro-rocket to compensate for the recoil thrust of the flamethrower gun, and (2) a generator to provide the gas which drives the thickened gasoline through the nozzle of the flamethrower gun. (Author)

AD-266 364 Div. 3, 16
(TIPTM/GEC) OTS price $1.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
COMPARISON OF DECHLORANE AND HEXACHLOROETHANE IN SMOKESCREEN COMPOSITIONS.
Rept. for May 56-Sep 60,
by Woodrow W. Reaves and Kenneth G. Carlon.
Aug 61, 14p. incl. illus. tables (CRDL Special publication no. 1-27)
Unclassified report

DESCRIPTORS: (*Smoke screens, *Pyrotechnics, *Smokes, Chlorides, Hydrocarbons, Volume, Melting, Density, Combustion, Toxicity, Stability.) (Pathology, Lungs and Bronchiectasts of Laboratory animals.) (Chlorides, Polycyclic compounds, Cyclomethanes.) (Chlorides, *Ethanes.) Smoke grenades, Respiratory system.

A comparison of two smokescreen compositions, Dechlorane and hexachloroethane, was made with respect to smoke volume, burning time, storage stability, and toxicity. The smoke volume and burning time of the Dechlorane composition are comparable to HC compositions. Its storage stability is superior to standard HC compositions. No significant difference in relative toxicity between the smoke clouds from the two compositions was found; both smokes produce chronic pathological degeneration of tissues of the respiratory system. (Author)

AD-266 368 Div. 3, 22
(TIPTW/JRG) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
TITAN FLASH CARTRIDGE,
by J. Wendell Leach. Oct 61, 22p. incl. illus. tables (Technical rept. no. FRL TR 33)
(Proj. 504-01-031)
Unclassified report

DESCRIPTORS: (Pyrotechnics, *Photoflash cartridges, Design, Tests.) (Photoflash cartridges, Upper atmosphere, Light, Production.) (Photoflash cartridges for Position finding of Guided missiles of Satellite vehicles.)

Extensive static and ballistic testing demonstrated that the Titan flash cartridge meets the specified requirements. The ejection distance is 65 ft within 2 sigma limits of + or - 15 ft, and the candlesecond value exceeds 120,000. (Author)

AD-266 486 Div. 3, 4
(TIPTM/BRW) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
EFFECT OF FUEL AND OXIDANT PARTICLE SIZE ON THE PERFORMANCE CHARACTERISTICS OF 60/40 POTASSIUM PERCHLORATE/ALUMINUM FLASH COMPOSITION,
by Seymour M. Kaye and Joel Harris. Nov 61, 25p. incl. illus. tables (Technical rept. FRL-TR-44)
Unclassified report

DESCRIPTORS: (*Pyrotechnics, *Potassium compounds, *Perchlorates, Powder metals, *Aluminum, Mixtures, Effectiveness, Luminescence, High altitude, Simulation.) (Fuels, Oxidizers, Particles, Thermochemistry, Physical properties.) (Cartridges, Loading, Materials.)

Sub-sieve $KClO_4$ and atomized Al powders, commercially classified into fine, medium and coarse fractions, were blended in 60/40 $KClO_4$/Al compositions, loaded into plastic Titan cartridge cases, and tested for luminosity characteristics at sea level and a simulated altitude of 80,000 feet. Those systems containing fine (0-12 micron), medium (0-23 micron), and coarse (6-85 micron) $KClO_4$ together with fine Al (0-17 micron) were the only systems which emitted enough light for pyrotechnic applications. Maintaining the aluminum particle size constant (fine fraction) and decreasing the oxidant particle size increased efficiency (candleseconds/gram) at both sea level and 80,000 feet. In general, the peak and integral light varied similarly at high altitude. At sea level, however, the composition with the coarse oxidant fraction produced the highest peak and integral light. (Author)

AD-266 563 Div. 3, 25, 4
(TIPTM/EJH) OTS price $2.60

Little, Arthur D., Inc., Cambridge, Mass.
RESEARCH IN ELECTRICAL PHENOMENA ASSOCIATED WITH AEROSOLS,
Quarterly rept. no. 4, 15 Apr-15 July 61,
by Bernard Vonnegut, Arnold W. Doyle, and D. Read Moffett. 15 July 61, 22p. incl. illus. tables.
(Contract DA 18-108-405-cml-852)
Unclassified report

DESCRIPTORS: (*Aerosols, Particles, *Drops, Electrical properties, Vapor pressure, Surface tension Production, Scattering.) (Surfaces, Electric fields, Electrostatic precipitation.) (Test equipment, Aerosol generators, Spray nozzles.) (Liquids, Octanoic acids, Phthalates, Atomization.)

Results of experiments on the charging of particles by spraying them against solid surfaces are presented. Large differences in charging characteristics were exhibited by various liquids. The effect of charge on the vapor pressure of small particles was evaluated for maximum charging levels. At maximum charge the electrical forces on a droplet are equal and opposite to the surface tension forces; the vapor pressure over a small drop is equal to that over a plane surface. This reduction in vapor pressure is important only for small drop sizes. The deposition of charged particles on small grounded objects was considered. Two geometries were analyzed to show that in spite of low average electric fields there can be a considerable intensification of the field around small grounded objects. As a result charged aerosols will be selectively deposited on these targets. (Author)

AD-266 792 Div. 3, 7
(TIPTW/JRG) OTS price $3.60

Aircraft Armaments, Inc., Cockeysville, Md.
E41R1 POINT SOURCE GAS ALARM.
Engineering progress rept., Phase 3, 2 Sep-14 Oct 61.
Nov 61, 33p. incl. illus. (Rept. no. ER-3538)
(Contract DA 18-108-cml-6553)
Unclassified report

DESCRIPTORS: (*Gas detectors, *Toxic agent alarms, Tests, Effectiveness, Reliability, Failure (Mechanics), Test equipment.) (Acoustic horns, Photoelectric cells, Photometers, Pumps, Tests.)

Progress on the development of the E41R2 gas alarm is reported, including a description of the engineering and manufacturing activity at Aircraft Armaments, and a summary of the service test program now in progress at Fort Benning, Ga.

AD-266 863 Div. 3, 10
(TIPTB/CCH) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
INHIBITION OF FLASHING OF AEROSOLS.
Quarterly progress rept. no. 6, 15 July-14 Oct 61, by C. C. Miesse. 15 Nov 61, 15p. incl. illus. tables.
(Contract DA 18-108-405-cml-777, Proj. D217)
Unclassified report

DESCRIPTORS: (*Aerosols, Flame propagation and Ignition and Measurement of Phthalates with Butyl radicals and Inhibition, Effectiveness of Bromine and Fluorides and Methanes, Drops, Aerosol generators.) (Test methods, Liquids, *Combustion, Tables, Additives.)

The lower flammability limit curve for dibutyl phthalate (DBP) was determined for mass median drop diameters (MMD) from 8 to 365 microns, and the inhibitive effect of 0.7% (by volume) of gaseous bromotrifluoromethane (Freon 13B-1) was noted. Flammability tests using the large drop aerosol generator indicated an increase in lower limit flammability concentrations for mass median diameters above 200 microns, so that the curve attains a minimum value in the 100 to 200 micron MMD range. Addition of 0.7% CF3Br to the air stream entering the lower end of the combustion tube increased the lower flammability limit from 18.6 to 42.5 mg/liter for DBP aerosols with an MMD of 205 microns. Experimental techniques were perfected for nuclei generation necessary for small drop aerosols, and determination of the impression factor for large drop DBP aerosols. (Author)

4. CHEMISTRY

AD-266 116 Div. 4
(TIPTM/TCG) OTS price $1.10

Research Chemicals, Inc., Burbank, Calif.
RARE EARTH CHALCOGENIDES.
Quarterly rept. no. 2, 1 Oct-31 Dec 60.
31 Dec 60, 4p. incl. illus. tables (Rept. no. RC 164)
(Contract NObs-84088)
Unclassified report

DESCRIPTORS: (*Rare earth compounds, Intermetallic compounds, Synthesis, Effectiveness, Processing, *Thermoelectricity, Electrical properties, Resistance, Voltage, Tests, Measurement.) (*Selenides or *Tellurides of Erbium, Gadolinium compounds, Lanthanum compounds, Samarium, Praseodynium compounds, Yttrium compounds, Ytterbium compounds, Melting, Sintering, Sulfides.

The thermoelectric properties of rare earth compounds containing S, Te, and Se are being investigated. A total of 45 chalcogenide compounds were prepared. Various Gd, La, Y, Sm, Yb, Er, and Pr selenides; Gd and Y tellurides; and Gd and Y sulfides were prepared. A mixed Y-Gd selenide was also synthesized. Resistivity and Seebeck voltages were determined, and x-ray diffraction analysis was made. La and Sm selenides were isostructural with the Gd compound. Neither the Gd telluride or sulfide appeared promising as the selenide.

AD-266 187 Div. 4, 17
(TIPTM/TCG) OTS price $1.60

Tennessee U., Knoxville.
INFLUENCE OF THE KRAMER EFFECT ON ADSORPTION ON METALS.
Quarterly rept. no. 5 (Final) 1 June 60-30 Sep 61, by Hilton A. Smith, G. S. Hathwar, and K. Z. Patil. 20 Oct 61, 14p. incl. illus. tables.
(Contract DA 33-008-ORD-1970; Continuation of Contract DA 33-008-ORD-1782)
(AROD rept. no. 2281:3)
Unclassified report

DESCRIPTORS: (*Adsorption, Fatty acids, Alcohols on *Alloys on *Metals with Heat treatment, *Processing, Machining, Surfaces, *Radioactive films, Exchange reactions, Measurement.) (Organic acids, Alkyl radicals, Acids in Cyclohexanes, Linoleic acid, Oleic acid.) (Water, Monomolecular films under Castor oil, *Films.) (Lead alloys, Tin alloys.)

Studies with Pb-Sn alloys were completed with the exception that additional exchange studies between nonadecanoic acid adsorbed on the alloy surface and in cyclohexane solution in contact with the surface should be performed. Lead-tin alloys showed adsorption and exchange characteristics which are much more like those of Pb than of Sn. Studies of the adsorption of nonadecanol on freshly machined metal surfaces indicate little adsorption of this alcohol. Studies of the adsorption, oleic and linoleic acids on freshly machined metals indicate that greater monolayer coverage can be obtained (assuming smooth surfaces) under conditions where a maximum of monolayer coverage is found when saturated acids were employed. Water monolayers produced under the surface pressure of spreading castor oil give essentially the anticipated compressed monolayer value for oleic acid, but only two-thirds of the expected value with linoleic acid. (Author)

AD-266 209 Div. 4
(TIPTM/EJH) OTS price $1.60

Washington U., Seattle.
(No title).
Technical rept. nos. 33-34.
1961, 20p. incl. tables.
(Contract Nonr-47716)
(ARPA Order no. 26-60, Task 2)
Unclassified report

DESCRIPTORS: (*Fluorides, *Sulfur compounds, *Oxyfluorides, Chemical reactions, Pyrolysis with Fluorides, Cyclopentenes or Ethylenes or Chlorides of Ethylenes and Vinyl chlorides or Sulfur compounds, Fluorides or Carbon compounds, Monoxides or Carbon tetrachloride.) (Sulfonyl radicals, Carbonyl radicals, Fluorides, Synthesis.) (Gases, Liquids, Physical properties, Stability, Decomposition, Chemical bonds, Molecular structure, Molecular spectroscopy, Nuclear magnetic resonance.)

Pentafluorosulfur hypofluorite reacts essentially quantitatively with perfluorocyclopentene (C5F5), tetrafluoroethylene, tetrachloroethylene, ethylene and vinyl chloride at room temperature to give compounds achieved by heterolysis of the O-F bond in the hypofluorite and addition of the Fl atom to one C of the double bond and the SF5O-group to the other C. Pentafluorosulfur hypofluorite, SF5OF, reacts with SF4 at temperatures above 140 to give SF6, SOF4, SF5OSF5 and SF5OSF5. SF5OF reacts with CO forming F2CO and F4SO. CC14 reacts with the SF5OF to give F2CO, Cl and F5SO5F5. When SF5OF is heated, decomposition starts at about 210, the products being SF6 and O. (Author)

This report includes:
THE REACTION OF PENTAFLUOROSULFUR HYPOFLUORITE WITH SOME ALEKENES, by Stanley M. Williamson and George H. Cady.

SOME REACTIONS OF PENTAFLUOROSULFUR HYPOFLUORITE, by Stanley M. Williamson and George H. Cady.

AD-266 281 Div. 4
(TIPTM/GEC) OTS price $1.10

Noyes Chemical Lab., U. of Illinois, Urbana.
NUCLEOPHILIC ATTACK OF AROMATIC RINGS BY ORGANOMETALLIC COMPOUNDS.
Final rept.,
by R. C. Fuson. 28 Sep 61, 4p, 28 refs.
(Contract DA 11-022-ORD-874, Proj. TB 2-0001(567))
(AROD Rept. no. 567:30) Unclassified report

DESCRIPTORS: (*Metalorganic compounds, Benzenes, *Hydroxides, *Benzoyl radicals, *Anilines, Displacement reactions, Chemical reactions.) (Grignard reagents, Ketones, Chemical reactions.) (Lithium compounds, Magnesium compounds, Metalorganic compounds.) (*Bibliography of Reports on Metalorganic compounds, Chemical reactions.) (Benzene derivatives, Furan, Synthesis.)

Among the discoveries made, the following may be mentioned: addition of organometallic compounds to hindered ketones involving aromatic rings was achieved in both the 1,4- and 1,6-manner with and without displacement of groups. Addition is greatly facilitated by the presence of a hydroxyl group in an o- or p-position of the aromatic ring. Similar results were observed with anils of benzophenones. New routes to terphenyls and to isobenzofurans were discovered. The first example of addition of an organolithium compound in the 1,6-manner has been recorded. In this connection side chain metalation was noted. Keto organolithium and organomagnesium compounds were studied. Transcarbonylation was used in a synthetic route to ketones. (Author)

AD-266 305 Div. 4, 10
(TIPTM/JSM) OTS price $1.60

Naval Propellant Plant, Indian Head, Md.
DESIGN STUDY OF AN ALTERNATE METHOD FOR PRODUCTION OF AMMONIUM PERCHLORATE,
by J. E. Dodgen. 17 July 61, 11p. incl. illus.
(Rept. no. TMR 190)
Unclassified report

DESCRIPTORS: (Production, Costs for *Ammonium radicals, *Perchlorates.) (Decomposition, Chemical reactions between Sodium compounds, Perchlorates and Ammonium radicals, Sulfates.)

Equipment required includes a NaC104-(NH4)2S04 dissolver, Na2S04 vacuum crystallizer, and NH4C104 cooling crystallizer. Solids feeders for the dissolver and a centrifuge and dryer for each crystallizer are also required. (NH4)2S04 and NaC104 are added to the dissolver which is maintained at 65 C to ensure solution of the reactants in the recycled mother liquor. The effluent passes to the Na2S04 crystallizer. By application of heat and constant vacuum, process water is removed and the Na2S04 is crystallized. Na2S04 is then removed in a slurry from the suspension container of the crystallizer, dewatered, washed, and dried. The effluent at 60 C passes to the NH4C104 crystallizer. After the solution has been cooled to 25 C, NH4C104 is selectively crystallized. The product is then dewatered, washed, and dried. The proposed process is about $0.022/lb less expensive than the existing process. Therefore, the real target price for NH4C104 is about $0.20/lb. This represents a potential saving to the government of $0.14 to $0.20/lb based on the current price of $0.34 to $0.40/lb. (Author)

AD-266 350 Div. 4, 14, 25
(TIPTM/EJH) OTS price $8.60

Denver Research Inst., Colo.
DETERMINATION OF THE RELATIONS BETWEEN STRUCTURE AND RADIATION STABILITY OF ARYL ETHER FLUIDS.
Rept. 1 Mar 60-31 July 61 on Solid State Research and Properties of Manner,
by George E. Bohner, Josef J. Schmidt-Collerus, and James H. Weber. July 61, 87p. incl. illus. tables (Rept. no. DRI 2003)
(Contract AF 33(616)7220, Proj. 0(8-7021)
(WADD TR 60-282, pt.2)
Unclassified report

DESCRIPTORS: (Heat resistant polymers, *Polymers, *Ethers.) (Phenyl radicals, Phenoxy radicals, Benzenes.) (Gamma rays, *Radiation effects, Radiation damage, Dosage, Ionization.) (Stability, Decomposition, Free radicals, Polymerization, Chemical reactions, Chemical bonds, Physical properties, Viscosity, Molecular structure.) (Spectrographic analysis, Chromotographic analysis, Infrared spectroscopy, Chemical analysis, Test methods.) (Lubricants, Hydraulic fluids, Fluids, Heat transfer.)

Radiolytic degradation mechanisms of diphenyl ether were studied. These mechanisms involve polymerization reactions and scission reactions of the C-O bond of the ether with formation of phenyl and phenoxy-free radicals. The reactions of these free radicals with diphenyl ether explain most of the chemical changes observed. The reaction of the phenyl radical at the ortho position of diphenyl ether results in the formation of phenol; however, a small amount of this radical forms benzene. The remainder of the phenyl radicals appear to react at the meta and para positions of the ether molecule to form biphenylyl phenyl ethers. The mode of the phenoxy radical reactions is less clear; they appear to react with diphenyl ether to form isomeric diphenoxybenzenes. (Author)

Division 4 - CHEMISTRY

AD-266 361 Div. 4, 25
(TIPTM/GEC) OTS price $1.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
THE STEREOCHEMISTRY OF ASYMMETRIC PHOSPHORUS COMPOUNDS. THE CORRELATION OF THE CONFIGURATIONS OF O-ETHYL AND O-ISOPROPYL METHYLPHOSPHONOTHIOIC ACIDS.
Rept. for Mar 58-Apr 59,
by Herbert Aaron, Roy T. Uyeda, and Harold F. Frack. July 61, 15p. incl. illus. tables.
(Rept. no. CRDLR 3077)
Unclassified report

DESCRIPTORS: (*Stereochemistry, Molecular isomerism, Configuration, *Metalorganic compounds, *Phosphorus compounds, Isomer of Propyl radicals, Methyl radicals, Phosphonium radicals, Thio radicals, Organic acids.) (Isomer of Ethyl radicals, Methyl radicals, Phosphonium radicals, Thio radicals, Organic acids.) (Amines, Salts of Organic acids, Melting.) (Alkoxy radicals, Ions, Displacement reactions of Phosphorus, Atoms in Thio radicals, Methyl radicals, Esters.) (Test methods of Melting, Chemical reactions, Displacement reactions.)

A study was made to correlate the configurations of the resolved isomers of O-isopropyl methylphosphonothioic acid and O-ethyl methylphosphonothioic acid by a physical and a chemical method. The physical method was based upon a quasi-racemate formation between dicyclohexylamine salts of the acids, the chemical method upon an alkoxide ion displacement at the asymmetric phosphorus atom of the S-methyl esters of these acids to form the common optically active ethyl isopropyl methylphosphonate. Based on the physical and the chemical evidence presented for the correlation of the configurations of O-ethyl and O-isopropyl methylphosphonothioic acid, it is concluded that the two levo enantiomorphs possess the same configuration. This conclusion agrees with that previously reached on the basis of the biochemical evidence. (Author)

AD-266 386 Div. 4, 17, 25
(TIPTM/REB) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE ROLE OF DILUTE BINARY TRANSITION ELEMENTS ON THE RECRYSTALLIZATION OF NICKEL.
Rept. on General Materials Problems, Research and Investigation,
by Ernest P. Abrahamson, II. Nov 61, 12p. incl. illus. table (Technical rept. no. WAL TR 830.3/7)
(Proj. 5B93-32-001)
Unclassified report

DESCRIPTORS: (*Nickel, Nickel alloys, *Crystallization, Temperature, Chemical impurities, Transition elements.) Solids, Solutions.

The effect of transition element binary solid solution additions upon the recrystallization temperature of nickel has been investigated. All additions raised the recrystallization temperature. Both the rate of change of recrystallization temperature with atomic percent solute and the limit of initial linearity are found to correlate with the free atom ground state outer electron configuration of the solute element. (Author)

AD-266 406 Div. 4, 14, 25
(TIPTM/GEC) OTS price $9.60

Westinghouse Electric Corp., Pittsburgh, Pa.
SYNTHESIS AND PURIFICATION OF DIELECTRIC MATERIALS.
Rept. for 1 July-31 Dec 60 on Applied Research in Electrical Electronic and Magnetic Material, by W. C. Divens, D. H. Hogle and others.
June 61, 100p. incl. illus.
(Contract AF 33(616)5979, Proj. 7371)
(WADC TR 59-337, pt. 3)
Unclassified report

DESCRIPTORS: (*Dielectrics, *Thin films, *Dielectric films, Synthesis, Purification, Dielectric properties, High temperature research, Plasma jets.) (*Aluminum compounds, Oxides.) (*Boron compounds, Chlorides, Nitrides.) (Bromides, Phosphides.) Ammonia, Materials, Inorganic substances, Anodes.) *Electric insulation.

Synthesis and purification of inorganic dielectrics was studied to achieve better dielectric properties at high temperatures up to 500 C. The research was concentrated on boron nitride and aluminum oxide. Thin films of boron nitride and anodically formed alumnia have been developed with satisfactory dielectric properties at 500 C. Work on arc plasma jet sprayed inorganic films starting with high purity materials yielded films with inferior dielectric properties, indicating contamination from the arc electrodes. (Author)

AD-266 412 Div. 4
(TIPTM/TCG) OTS price $1.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
FURTHER SHOCK-TUBE STUDIES OF THE HOMOGENEOUS DECOMPOSITION OF NH_3,
by T. A. Jacobs. Oct 61, 5p. illus. (Technical rept. no. 3)
(Contract AF 49(638)984)
(AFOSR-1471) Unclassified report

DESCRIPTORS: (Infrared research, Shock tubes, Decomposition of *Ammonia, Reaction kinetics, Thermodynamics, Least squares method.) (Gases, Mixtures, High pressure research.) Chemical reactions, Design.

The rate of decomposition of NH_3 in Ar was measured between 2000 to 3000 K by following the rate of decrease of NH_3 emission intensity in the 2.7 to 3.2 micron wavelength region. Data indicated that the thermal decomposition of NH_3 follows a kinetic law given by $d(NH_3)/dt = k(NH_3)$ to the 3/2 power (Ar) to the 1/2 power where k equals (2.5 x 10 to the 13th power) e to the -77,700/RT power liters/mole-sec. (Author)

AD-266 444 Div. 4
(TIPTM/EJH) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
THE TRANSITION METAL HYDRIDE COMPLEXES,
by Bernard Siegel. 5 Oct 61, 18p. incl. illus. 50 refs. (Rept. no. TDR-930(2210-12)TN-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Transition elements, Metallic compounds, Carbonyl radicals, *Hydrides, *Metalorganic compounds, *Complex compounds, *Chelate compounds, Molecular structure, Chemical bonds.) (Pyridines, Methanes.) (Synthesis, Chemical properties, Molecular spectroscopy.) (Nickel compounds, Palladium compounds, Platinum compounds, Cobalt compounds, Rhodium

compounds, Iridium compounds, Iron compounds, Ruthenium compounds, Osmium compounds, Manganese compounds, Technetium compounds, Rhenium compounds, Chromium compounds, Molybdenum compounds, Tungsten compounds.) Bibliography.

The status of present-day knowledge concerning transition metal hydrides that are stabilized by ligand molecules is summarized. Particular emphasis is given to the structures and chemical properties of such complex molecules and to conjectures about the possible structures of complexes as yet unknown. The literature survey on which this report is based was intended to provide background information for the experimental program on transition metal hydrides. (Author)

AD-266 479 Div. 4, 26
(TIPTM/EJH) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PRODUCTION OF HYDROGEN FLUORIDE FROM SILICON TETRAFLUORIDE,
by N. M. Boguslavskiy, S. N. Vol'fkovich and others. 23 Oct 61, 9p. incl. illus. tables. (Trans. no. FTD-TT-61-105 of Khimicheskaya Promysshlennost' 7:6-8, 1961)
Unclassified report

DESCRIPTORS: (*Hydrogen compounds, *Fluorides, Production, Silicon compounds, Dioxides, Synthesis.) (Fertilizers, Phosphates, Production.) (Chemical reactions, *Silicon compounds, Fluorides and Ammonium radicals, Sulfuric acid.) (Chemical industry, Industrial production, USSR, Technological intelligence, Translations.)

Results confirmed the possibility and expediency of converting silicon fluoride gases evolved in the production of superphosphate to hydrogen fluoride with the simultaneous production of quality silica. The new technological scheme of production ensures the possibility of producing a mixture of ammonium bifluoride and ammonium fluoride with a concentration of 94-96%. During decomposition of ammonium bifluoride and fluoride with sulfuric acid the degree of liberation of fluorine as hydrogen fluoride reaches 97%. The method developed for producing hydrogen fluoride makes it possible to organize this production without harmful waste products. (Author)

AD-266 515 Div. 4, 10
(TIPTM/TCG) OTS price $5.60

General Applied Science Labs., Inc., Hempstead, N. Y.
A THEORETICAL INVESTIGATION OF HYDROGEN-AIR REACTIONS. PART I. BEHAVIOR WITH ELABORATE CHEMISTRY,
by P. A. Libby, H. S. Pergament, and M. H. Bloom. Aug 61, 52p. incl. illus. tables, 11 refs. (Technical rept. no. 250)
(Contract AF 44(638)991, Proj. 9751)
(AFOSR-1378) Unclassified report

DESCRIPTORS: (*Reaction kinetics, Chemical reactions, Combustion, *Hydrogen and *Air, Mixtures under Adiabatic gas flow, Controlled atmospheres, Temperature, Atomic weight, Theory, Analysis, Equations of state.) (Oxygen, Atoms, Hydroxides, Thermodynamics, Enthalpy, Energy, Mass energy relation.) *Thermochemistry.

A study was made of the reaction history of hydrogen-air mixtures under adiabatic, isobaric conditions. An elaborate chemistry was treated with a view toward establishing rather accurate reaction histories. In the future, simplified chemical models will be considered which will permit approximate analyses of the non-equilibrium behavior of hydrogen-air mixtures under flow conditions as, for example, in exhaust nozzles and mixing regions. The results presented for a variety of initial temperatures, pressures and mixture ratios indicate that during the early phases of the reaction the main products achieve close to their equilibrium values with little change in temperature. However, the intermediates, atomic O, atomic H, and the OH radical exceed their equiibrium values. The remaining, major portion of the reaction time involves the decay of these intermediates and the chemical energy release associated therewith. Because of its thermodynamic importance, i.e., its large enthalpy per unit mass, atomic H appears to be the most important intermediate for the reaction considered. (Author)

AD-266 521 Div. 4, 25, 12
(TIPTM/EJH) OTS price $6.60

Geophysics Corp. of America, Boston, Mass.
A SURVEY OF CHEMILUMINESCENT REACTIONS IMPORTANT FOR MISSILE TRAILS,
by Winifred Tank. 1 Nov 61, 66p. incl. illus. tables, 82 refs. (Scientific rept. no. 1; GCA Technical rept. no. 61-41-A)
(Contract AF 19(628)231)
(AFCRL-1039): (ARPA Order no. 258-61)
Unclassified report

DESCRIPTORS: (Rocket propellants, Rocket fuels, *Exhaust gases, Chemical reactions, Gases, Atoms, Upper atmosphere, Free radicals, *Photoemission, Luminescence.) (Exhaust gases, Hydrogen, Water vapor, Carbon compounds, Monoxides, Carbon dioxide, Methanes, Hydrocarbons.) (Gases, Upper atmosphere, Atoms, Oxygen, Nitrogen, Hydrogen, Ozone, Nitrogen compounds, Oxides.) (*Recombination reactions, Reaction kinetics.) (Infrared spectroscopy, Spectrographic analysis.) (Guided missile tracking systems, Guided missiles, Detection.) *Bibliography.

The delineation of the known and unknown quantities involved in the phenomenon of chemiluminescence with regard to missile trails is discussed. The compilation reveals the following facts: (1) No theory or theories exist to unify the data; (2) Reported mechanisms are, for most cases, still in the postulatory stage; (3) In reported incidents of chemiluminescence, the spectral ranges covered are greatly limited by experimental apparatus; (4) In reports of atomic flames, the data obtained have relatively large uncertainties; and (5) The range of pressure and temperature within which the experiments have been performed were extremely limited. The only reaction that has been sufficiently investigated to serve as a basis for theoretical study is O + NO equals NO2 + hv, Milton, E. R. V. and Dunford, H. B., J. Chem. Phys. 34:51, 1961. O + NO + M equals NO2 + M, Frankenburger, W., Atomic and Free Radical Reactions, N. Y., Reinhold Publ. Co., N. Y., 1954, p. 594. (Author)

AD-266 542 Div. 4, 14
(TIPTM/EJH) OTS price $1.60

Ionics, Inc., Cambridge, Mass.
PURIFICATION OF ORGANIC COMPOUNDS BY MEMBRANE

PERMEATION.
Bimonthly progress rept. no. 2, 1 Sep-1 Nov 61,
by John L. Eisenmann. 17 Nov 61, 10p. incl.
tables.
(Contract DA 18-108-cml-6626)
Unclassified report

DESCRIPTORS: (Organic compounds, *Hydrocarbons, Purification, Separation.) (Mixtures, Hydrocarbons, *Heptanes with *Pentanes or *Octanes.) (Molecules, Diffusion, Membranes.) (*Films, *Membranes, Plastics, Polymers, Ethylenes, Propenes, Semipermeability, Density, Physical properties.) (Test methods, Chromatographic analysis.)

Data is reported for the permeation of several mixtures of aliphatic hydrocarbons through polyethylene and polypropylene films. Film density appears to affect rate and perhaps selectivity. (Author)

AD-266 599 Div. 4
(TIPTM/GEC) OTS price $2.60

Naval Research Lab., Washington, D. C.
PREPARATION AND PROPERTIES OF SOME HYDROCARBON-SOLUBLE CERIUM AND IRON COMPOUNDS.
Interim rept.,
by H. R. Baker, J. G. O'Rear, and others.
22 Sep 61, 21p. incl. illus. tables, 41 refs.
(NRL rept. no. 5641)
Unclassified report

DESCRIPTORS: (Silicones, Stabilization, *Metalorganic compounds, *Antioxidants, *Metallic soaps, Chelate compounds, Synthesis, Displacement reactions, Chemical reactions, Chemical properties.) (*Cerium compounds, Ammonium radicals, Nitrates.) (*Salts, Toluenes, Sodium.) (*Iron compounds, Sulfates.) (Infrared spectroscopy, Molecular structure.) (Solubility in Hydrocarbons,) (Luminescence, Catalysts of Complex compounds.)

Metathesis between sodium p-toluate and ceric ammonium nitrate yields benzene-soluble basic ceric toluates. The basic ceric toluates Ce(Tol)(OH)O and Ce(Tol)1.5(OH)1.5(O)0.5, demonstrably low in toluic acid, have been isolated. Both react with disalicylalpropylenediamine (H2DSPD) to form water, toluic acid, and bis(N,N'-disalicylalpropylenediamine) cerium (IV), (Ce(DSPD)2). Ceric isopropoxide solvate is dimeric and infinitely soluble in benzene. The isopropoxide reacts with toluic acid to give isopropyl alcohol and ceric toluate which is sparingly soluble in benzene. Reactions of either the isopropoxide or normal soap with excess H2DSPD afford an anhydrous route to Ce(DSPD)2. The DSPD complexes of both Ce(IV) and Fe(III) are effective catalysts for luminescence in the perioxide oxidation of luminol. (Author)

AD-266 675 Div. 4
(TIPTM/EJH) OTS price $1.60

Texas A. and M. Coll., College Station.
INVESTIGATION AND SYNTHESIS OF ORGANOPHOSPHORUS COMPOUNDS.
Final rept. 1 July 60-30 Sep 61,
by A. F. Isbell. 30 Sep 61, 9p. table.
(Contract DA 18-108-405-cml-858)
Unclassified report

DESCRIPTORS: (*Metalorganic compounds, Organic compounds, *Phosphorus compounds, Sodium compounds, Synthesis, Chemical analysis, Chromatographic analysis.) (Phosphoric acids, *Esters, Fluorination.) (Alkyl radicals, Phosphonic acids, *Esters, Chemical reactions, Sodium, Liquid metals, Solids, Gases, Organic solvents.)

Investigations discussed are: (1) the reaction between dialkyl alkylphosphonates and metallic Na; (2) methods for the synthesis of fluoroalkylphosphonates. (1)-Molten Na was dispersed in an inert hydrocarbon solvent at 110 degrees followed by the addition of the phosphonate ester. There were generally 2 principal products, one a gas and the other a solid. The reaction with metallic Na failed to take place with the trialkyl esters of phosphorous acid, the trialkyl esters of phosphoric acid, and the alkyl esters of dialkylphosphonic acids. All the phosphonic esters tried to date reacted readily. (3) Efforts to produce fluoroalkylphosphonate products were not successful. However, reactions of interest included the cleavage of diethyl trichloromethylphosphonate with KF dihydrate to give CCl4 as one product; a cleavage of diethyl trichloromethylphosphonate by anhydrous KF to give diethyl phosphorofluoridate.

AD-266 688 Div. 4
(TIPTM/EJH) OTS price $1.60

United Technology Corp., Sunnyvale, Calif.
THERMOCHEMISTRY OF OXYGEN-FLUORINE BONDING.
Quarterly technical summary rept. no. 2, 1 July-30 Sep 61,
by R. Anderson. Oct 61, 12p. incl. illus. table.
(Contract Nonr-343300)
(ARPA Order no. 184-61) Unclassified report

DESCRIPTORS: (*Nitrogen compounds, *Oxyfluorides, Fluorides.) (*Fluorides, *Nitrates.) (*Thermochemistry, Heat of formation, Synthesis, Chemical analysis, Infrared spectroscopy, Hydrolysis, Chromatographic analysis, Test equipment, Calorimeters.) (*Oxygen, *Fluorine, *Chemical bonds, Thermochemistry.)

The objectives of the study were: (1) Modification of existing experimental equipment for a more detailed study of the synthesis of NO2F and NO3F; (2) Further development of consistent and accurate analytical techniques (including mass spectroscopy, gas chromatography, hydrolysis, purification by fractional distillation, and infrared spectrophotometry) for determination of reaction products in the synthesis of NO2F and NO3F; (3) Assembly and calibration of a suitable flow calorimeter for measurement of the heats of formation of NO2F, NO3F, and ClO4F; (4) Synthesis and purification of NO2F from elemental F and NO2 and NO3F from concentrated HNO3 and elemental F; and (5) Preliminary evaluation of the heat of formation of NO2F from measurement of the heat evolved during reaction of elemental F and NO2. (Author)

AD-266 690 Div. 4, 22
(TIPTW/JRG) OTS price $1.10

Allegany Ballistics Lab., Hercules Powder Co., Cumberland, Md.
IMPROVED METHOD OF DETERMINATION OF AMMONIUM

PERCHLORATE IN CASTING POWDER,
by A. W. Tiedemann, Jr., and E. F. Reichenbecher. 1961, 3p. incl. table (Rept. no. ABL/Z-31)
(Contract NOrd-16640)
Unclassified report

Presented at the Seventeenth Meeting of Joint Army-Navy-Air Force Panel on Analytical Chemistry of Solid Propellants, Oct 3-6, 1961, Aerojet-General Corp., Sacramento, Calif.

DESCRIPTORS: (*Ammonium radicals, *Perchlorates, Determination.) (*Chlorides, *Electrolytic titration.) (Explosives, Propellants, Analysis.)

A potentiometric method applicable to casting powders and propellants for titration of chloride ion produced by reduction of ammonium perchlorate in a Parr or Boas bomb is described. A Beckman model K automatic titrator is utilized. This procedure reduces the operator variability experienced in the Mohr method. (Author)

AD-266 806 Div. 4
(TIPTB/LH) OTS price $5.00

Ballistic Research Labs., Aberdeen Proving Ground, Md.
FREE RADICALS BIBLIOGRAPHY AND SURVEY OF PUBLICATIONS (UP TO 1959),
by George I. Lavin, Arthur D. Coates, and John A. Rakaczky. Aug 61, 400p. (BRL rept. no. 1142)
(Proj. 599-04-002)
Unclassified report

DESCRIPTORS: (*Bibliography, *Free radicals, Chemical properties.)

A survey was made of the free radical literature published up to and including the year 1959. Approximately 2200 references are presented in the form of the title of the paper, author, and a brief description of the work where the title is not self-explanatory. (Author)

AD-266 846 Div. 4
(TIPTM/TCG) OTS price $1.60

Tulane U., New Orleans, La.
THE REACTION OF 8-HYDROXYQUINOLINE WITH COPPER (II) SALTS,
by James C. Fanning and Hans B. Jonassen.
15 Nov 61, 6p. tables (Technical rept. no. 2)
(Contract Nonr-47509, Proj. NR 052-424)
Unclassified report

DESCRIPTORS: (Chemical reactions, *Quinolinol with *Copper compounds in Methanols and Water, Solutions, Infrared spectroscopy, Magnetic properties, Synthesis.) (*Salts, Nitrates, Chlorides, Chlorates, Bromides, Acetates.)

8-Hydroxyquinoline (hqn) was reacted with $CuSO_4.5H_2O$, $Cu(NO_3)_2.3H_2O$, $CuCl_2.2H_2O$, $CuCl_2$, $CuBr_2$, $Cu(C_2H_3O_2)_2.H_2O$ and $Cu(ClO_4)_2.6H_2O$. The reaction was carried out in both methanol and water at varying concentrations of the Cu salts. Two forms of Cu(hqn)2 were prepared. CuhqnX, where X is Cl or Br, was prepared when halide salts were used. These various Cu (II) oxinates have unusual magnetic and spectral properties. (Author)

AD-266 921 Div. 4
(TIPTM/GEC) OTS price $1.10

Applied Science Labs., Inc., State College, Pa.
RESEARCH STUDY OF PHYSICOCHEMICAL TECHNIQUES FOR THE PURIFICATION OF ORGANIC COMPOUNDS.
Bimonthly progress rept. no. 19, 1 Sep-1 Nov 61, by Robert F. Sweeny and Arthur Rose. 29 Nov 61, 7p. incl. tables.
(Contract DA 18-108-405-cml-176)
Unclassified report

DESCRIPTORS: (*Organic compounds, *Organic solvents, Polymers, Solutions, *Purification, Diffusion through *Films, Membranes.) (*Films, Acetates of Vinyl chlorides, Cellulose acetate, Ethyl cellulose, Butyrates of Cellulose acetate, Temperature, Semipermeability.) (*Hexanes, *Ethanols, *Acetones, *Chloroform.) (Butyl radicals, *Amines, *Phosphates, *Phosphites, *Borates.) (Hexanes, Amines.) (Phenyl radicals, Phosphites.) (Chlorides, *Napthalenes.) (Alkoxy radicals, Ethyl radicals, *Silanes.)

Rate determinations for high molecular weight compounds permeating several commercial films were completed and 7 more instances of rates between 4 and 12 grams/hr-sq-m were found. Rate measurements for neohexane were completed and rate factors for n-hexane, acetone, chloroform, and ethanol with ten commercial films were calculated. A correlation between polarity of film and permeant and the rate is illustrated. Thirteen additional binary separation-rate tests were completed. (Author)

AD-266 945 Div. 4, 20
(TIPTM/TCG) OTS price $7.60

General Dynamics/Fort Worth, Tex.
SYNRADSIS, THE SYNTHESIS OF CHEMICAL COMPOUNDS THROUGH THE USE OF NUCLEAR RADIATION,
by G. K. Able, Jr. 17 Nov 61, 73p. incl. illus. 158 refs. (Doc. no. MR-N-288; NARF-61-37T; FZM-2386)
(Contract AF 33(657)7201)
Unclassified report

DESCRIPTORS: (*Synthesis, Radiation effects, *Inorganic substances, *Organic compounds, *Nuclear energy, Heat, Pressure, Catalysts, Test methods.) (*Chemical reactions, Polymerization, *Bibliography, Polymers, Metalorganic compounds, Semiconductors.)

Synradsis is a portmaneau word for the phrase synthesis of chemical compounds through the use of nuclear radiation, alone or in conjunction with heat, pressure, catalysts, or other conventional techniques. This report discusses a set of guiding principles for planning and executing a synradsis, the advantages of synradsis over conventional techniques, the kinds of reactions that appear favorable to synradsis, and specific synradses that look promising. It concludes with a two-part bibliography in which (1) examples of synradses taken from the literature are described, and (2) abstracts of literature articles are listed in accordance with the type of synradsis reaction (addition, alkylation, etc.).

AD-266 962 Div. 4
(TIPTM/TCG) OTS price $1.10

Pennsylvania State U., University Park.
REACTIVITY OF METHYLENES (BIVALENT CARBON

SPECIES).
Final rept. 15 June 58-16 June 61,
by Philip S. Skell. 16 June 61, 3p.
(Contract DA 36-061-ORD-607)
(AROD Rept. no. 208:6)
Unclassified report

DESCRIPTORS: (*Methanes, *Ethylenes, Methyl radicals, Ethyl radicals, Propyl radicals, Thio radicals, Free radicals, Chemical properties, Stereochemistry, *Reaction kinetics.) (Alkoxy radicals, Halocarbons, Carbon, Ions in Hydroxides, Solutions, Carbon, Oxides, Cyclomethanes.)

This program identified for the first time some bivalent C species, diradicals (triplet state), which were named as derivatives of methylene. Methylenes show non-sterepspecificity and radical selectivity in additions to olefins. The species discovered and characterized were diphenylmethylene, propargylene, methylpropargylene, and phenylpropargylene. This work was also extended to thioxanthylene, and para substituted diaryl carbon systems. A study of alkoxyhalocarbenes (ROCX) revealed a unique method of generating carbonium ions in basic media, thus making possible a study of reactions of carbonium ions in basic media. These intermediates, which isosteres of alkyldiazonium salts, decompose to carbonium ions and CO. It was discovered that carbonium ions can cyclize to cyclopropanes. A study of the reactions of alkyl halides with alkali metal or strong bases revealed that carbenes are intermediates in the formation of cyclopropane products. (Author)

AD-266 967 Div. 4
(TISTP/TCG) OTS price $1.10

North Carolina U., Chapel Hill.
CRITICAL PHENOMENA AND RELATED TOPICS.
Final rept.,
by O. K. Rice. 1961, 5p, 10 refs.
(Contract DA 36-034-ORD-1482)
(AROD rept. no. 895:15) Unclassified report

DESCRIPTORS: (*Liquids, Phase studies, *Equation of state, Cyclohexanes and Anilines or Carbon tetrachloride, Ethyl radicals and Ethylenes and Glycols of Ethyl ethers, Water, Lithium compounds, Sulfates, Additives, Thermodynamics, Dilatometers.) (Entropy, *Gases, Spheres, Phase transitions.) (Energy, Specific heat, *Helium, *Liquefied gases, Density, Velocity, Viscosity, Magnetic moments, Thermochemistry, Atomic structure.) (Nuclear physics, *Valence, *Chemical bonds, Theory, Carbon compounds.)

AD-266 989 Div. 4
(TIPTM/TCG) OTS price $1.60

Olin Mathieson Chemical Corp., New Haven, Conn.
CHEMISTRY OF DECABORANE PHOSPHORUS COMPOUNDS. I. NUCLEOPHILIC SUBSTITUTIONS OF BIS(CHLORODIPHENYLPHOSPHINE) DECABORANE,
by Hansjuergen Schroeder, Joseph R. Reiner, and Theodore L. Heying. 28 Nov 61, 12p. incl. illus. table (Technical rept. no. 3)
(Contract Nonr-339500, Proj. NR 356-431)
Unclassified report

DESCRIPTORS: (*Decaboranes, *Phosphorus compounds, Chlorides, Phenyl radicals, *Phosphines or Esters, Acids, Azides, Synthesis, Chemical analysis, Molecular structure.) (Chemical reactions with Ammonia, Amines in Alcohols, Solutions.) (*Substitution reactions of Chlorine with Alkoxy radicals, Hydroxides.) Reaction kinetics, Complex ions.

Bis (chlorodiphenylposphine) decaborane was prepared by the reaction of diphenylchlorophosphine with decaborane and was chemically proven to have the phosphine ligands attached at the 6, 9-positions of the B10H12 unit. The reaction of B10H12(Ph2PCl)2 with NH3 and primary aliphatic amines in alcohols was found to give nearly quantitative yields of the respective aminocompounds. The use of secondary aliphatic amines in alcohols or water, however, led to the replacement of Cl with alkoxy and hydroxy, respectively, resulting in the formation of esters or the acid. The di-azide was obtained by treatment with sodium azide. (Author)

5. COMMUNICATIONS

AD-266 389 Div. 5
(TIPTE/CCD) OTS price $4.60

Philco Corp., Philadelphia, Pa.
TSEC/HY-2 CHANNEL VOCODER, MODIFIED.
Quarterly rept. no. 1, 1 June-31 Aug 61,
by P. E. McChesney. 31 Aug 61, 40p. incl. illus. tables.
(Contract DA 36-039-sc-87215, Proj. 3B31-06-031)
Unclassified report

DESCRIPTORS: (*Speech transmission, *Speech representation, *Electronic equipment, Synthesis, Coding, Design.) (Voice communication systems, Analog systems, Digital systems, Printed circuits, Band-pass filters, Electronic circuits.) (Transistors of Germanium, Silicon.)

Research is conducted to design, develop, construct, and deliver 2 equipments for the laboratory and field evaluation of VOCODER systems. Design considerations and factual data gathered for the development of the modified VOCODER are presented. All analog circuits will be similar to those used in the TSEC/HY-2 VOCODER. The modifications required to make them adaptable to the various digital modes of operation are described. Data are tabulated concerning frequency distribution of the band-pass filters for the various channel options prepared for operation with a 12-, 16-, 18-, or 20- channel VOCODER. This is presented in tables. All digital logic diagrams were completed. The various operational modes are compatible with several transmission bit rates, and can be programmed to vary the number of spectrum channels, spectrum coding levels per sample, and coding levels per sample; any or all of these options can be utilized in either a VOCODER or Semi-VOCODER mode. (Author)

AD-266 453 Div. 5, 26
(TIPTW/EET) OTS price $4.60

Burndy, Norwalk, Conn.
RESEARCH DESIGN AND DEVELOPMENT OF TOOL AND SPLICE FOR TELEPHONE CABLE WF-16( )/(U).
Quarterly rept., 18 May-15 Sep 61,
by Robert Eames. 15 Sep 61, 41p. incl. illus.
(Contract DA 36-039-sc-87226)
Unclassified report

DESCRIPTORS: (Telephones, *Telephone cables, Splicing tools, Cutting tools, Joints, Materials, Design, Processing, Production, Manufacturing methods, Test methods, Test equipment, Tests.)

Continued progress is reported on the development of a tool and splice for telephone cables. The basic tool is a modified BURNDY Ratchet Control Type HYTOOL. It has an open head made of heat treated aluminum alloy. Its size is approximately 10 1/2 in long and 3 in wide. Fifty pounds hand force are required to operate it. The present approach is to use Nylon (Zytel 101) as the insulating sleeve. The inner and outer ferrules shall be made either of copper or copper alloy. The splice will accomodate 2 wires on each side. (Author)

AD-266 540 Div. 5
(TIPTE/CRJ) OTS price $3.60

International Business Machines Corp., Rockville, Md.
IMPROVED PHASE MODULATOR-DEMODULATOR.
Quarterly progress rept. no. 1, 1 May-31 Aug 61, by Margaret George. 5 Sep 60, 36p. incl. illus. (Contract DA 36-039-sc-87248)
Unclassified report

DESCRIPTORS: (*Communication systems, Data transmission systems, Digital systems, Phase modulation, Design.) (*Modulators, Digital systems, Transistors, Electrical networks, Electronic circuits, Design.) (Telephone lines, Voice communication systems, Circuits.)

Effort concerns the transferring of digital data over voice communications channels. The contractor (IBM) will develop and construct a digital modulator-demodulator using transistor circuits, phase modulation, and bit synchronism. Progress is presented on the logic design and on the electrical design of each circuit. Progress was satisfactory. Almost all of the circuits were designed and most were tested.

AD-266 756 Div. 5, 30
(TIPTE/CDM) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
METHOD OF MEASURING THE RELIABILITY OF TELEGRAPH COMMUNICATIONS (Sposob Izmereniya Nadezhnosti Telegrafnykh Svyazey),
by A. I. Kordobovskiy. 24 Oct 61, 2p. (Trans. no. FTD-TT-61-140 of Byulleten Izobreteniy 17:p. 19, 1959)
Unclassified report

DESCRIPTORS: (USSR, Technological intelligence, Translations, Patents.) (*Communication systems, *Telegraph systems, Reliability, Measurement, Test methods.)

AD-266 761 Div. 5
(TIPTE/NTM) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A METHOD FOR COUPLING A MULTICHANNEL COMMUNICATIONS SYSTEM WITH TIME-DIVISION MULTIPLEX TO A SYSTEM WITH CHANNEL FREQUENCY-DIVISION MULTIPLEX, AND A DEVICE FOR THIS PURPOSE,
by L. A. Korobkov. 20 Oct 61, 3p. incl. illus. (Trans. no. FTD-TT-61-185 of Russian Patent no. 128907, 4p., 1959)
Unclassified report

DESCRIPTORS: (Translations, Technological intelligence, USSR.) (*Communication systems, *Multiplex transmission, *Radio communication systems, Coupling circuits, Frequency modulation, Detection, Linear systems, Signals, Low frequency, Storage, Memory devices.)

Methods are known for the coupling of multichannel communications systems with time-division multiplex to a system with channel frequency-division multiplex, based on transduction with full demodulation of linear signals. Devices are also known in which the terminal apparatus used is the same as that used in wire systems, so that the systems are interchangeable. The drawback of such systems and devices is their complexity, since their realization requires conversion of the group signal to low frequency. In the method described, this drawback is eliminated; the fragments of the group signal of the system with time-division multiplex are transformed into signals by means of a frequency-time selection device and frequency conversion, and then are stored successively by the memory device and are continuously and simultaneously reproduced. This is achieved by the use of a time-frequency selector to whose output a storage device is connected. (Author)

AD-266 827 Div. 5
(TIPTE/CDM) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
APPLICABILITY OF CODING TO RADIO TELETYPE CHANNELS,
by A. B. Fontaine. 27 Oct 61, 6p. illus. table. (Rept. no. 25G-3)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Radio teletype systems, *Communication systems, Frequency shift keyers, High frequency, Reliability, Coding, Errors, Statistical analysis, Corrections.)

Approximately 300 hours of radio teletype data were analyzed in a manner similar to an analysis performed for telephone channels to determine the applicability of coding theory to radio teletype channels. The results indicate that while correcting codes are impractical for improving the reliability of a teletype channel, error detect and repeat schemes with about 10% redundancy will reduce the probability of error to a negligible amount. (Author)

AD-266 835 Div. 5
(TIPTE/NTM) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO. SYSTEM CALCULATIONS,
by Clyde L. Ruthroff and William C. Jakes, Jr. Nov 61, 13p. incl. illus. tables (NASA Technical note no. D-1128)
(In cooperation with Bell Telephone Labs., Inc., Whippany, N. J., Contract NASw-110)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-1128.

DESCRIPTORS: (*Radio transmission, *Radio communication systems, Reflection, *Balloons, Flight paths, *Satellite vehicles, Orbital flight paths, *Reflectors.) (Signal-to-noise ratio, Mathematical analysis, Aerodynamics.) (Power amplifiers, Radiofrequency, Antenna amplifiers, Radio receivers, Noise (Radio), Modulation, Microwaves.)

The primary objective of Project Echo was the transmission of radio communications between points on the earth by reflection from the balloon satellite. This paper describes system calculations made in preparation for the experiment and their adaptation to the problem of interpreting results. The calculations include path loss computations, expected audio signal-to-noise ratios, and received signal strength based on orbital parameters. (Author)

AD-266 903 Div. 5, 8
(TIPTE/NTM) OTS price $9.60

Sylvania Electric Products, Inc., Waltham, Mass.
ADDITIONAL COMPUTATIONS ON THE PERFORMANCE OF ANTENNA SYSTEMS IN SCATTER-TYPE RECEPTION.
Scientific rept. no. 3, on Theory of Antenna Performance in Scatter-Type Reception,
by W. M. Cowan and D. F. Johansen. Aug 61, 113p. incl. illus. tables, 11 refs.
(Contract AF 19(604)7237)
(AFCRL-741) Unclassified report

DESCRIPTORS: (*Antennas, *Radio communication systems, Density systems, *Frequency shift keyers, *Microwave communication systems, Radio signals, *Communications theory, Radio waves, Atmosphere, Scattering, *Antenna radiation patterns, Radio transmission.) (Mathematical analysis, Numerical analysis, Statistical processes, Errors, Measurements.)

Extended computations are given of previously formulated theoretical results on the performance of receiving antenna systems in scatter-type reception. The computations cover optimum systems and angle and space diversity systems, using both discrete and continuously distributed source models. Results are considered important both in furthering the understanding of existing antenna systems, and in lending perspective to the possibilities for design of more nearly optimum systems. (Author)

AD-266 959 Div. 5
(TIPTE/CRJ) OTS price $11.50

Melpar, Inc., Falls Church, Va.
A DIGITALIZED SPEECH COMPRESSION SYSTEM.
Rept. for Aug 59-Aug 61,
by D. C. Coulter, D. M. Early, and R. E. Irons.
Sep 61, 142p. incl. illus. tables.
(Contract AF 33(600)39962, Proj. 4335)
(ASD TR 61-494) Unclassified report

DESCRIPTORS: (*Military communications, *Voice communication systems, Digital systems, Analog-to-digital converters, Transistors, Coding, Airborne, Life expectancy, Reliability, Mechanical properties, Electrical properties, Tests, Operation.) (Speech, *Speech transmission, Intelligibility, Quality control.) (Electronic circuits, Switching circuits.)

The electrical, mechanical, and reliability phases are described of the construction of a service test model Digitalized Speech Compression System. This flyable, fully transistorized system is designed to permit 2-way voice communication through a digital channel at either 1000 or 1200 bits-per-second. Operational data extracted from 2 service test models are given. Methods used to arrive at a suitable mechanical configuration in order to package the system in 1.3 cu. ft. and to meet MIL-E-5400 are documented. Efforts expended to obtain a predicted mean-time-between-failure of 711.5 hours are covered. Articulation testing demonstrates that the system exhibits a phonetically balanced word-list articulation of over 75%, corresponding to a sentence intelligibility in excess of 94%. Other testing, such as environmental and digital jamming, is also discussed. (Author)

6. DETECTION

AD-266 133 Div. 6
(TIPTW/RD) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
EFFECTS OF CW-396A RIGID RADOME ON AN/FPS-6 PERFORMANCE,
by Charles M. Blank. Oct 61, 15p. incl. illus.
(Rept. no. RADC TN-61-189)
(Project 5579)
Unclassified report

DESCRIPTORS: (Radar equipment, Height finding, Reduction of Radar interference, Tests.) (Reduction of *Radar interference by *Radomes, Antenna radiation patterns; Radar antennas.) (Radar stations, Europe, Reliability.)

At a number of radar installations, a considerable degree of high angle clutter is apparent on the range height indicator of the AN/FPS-6 radar system when covered by a CW-396A rigid radome. A description of the nature and source of the clutter along with steps taken to alleviate it is presented. Theoretical corroboration is given for the results obtained during a series of tests on the AN/FPS-6 with the CW-396A radome. (Author)

AD-266 138 Div. 6
(TIPTW/EET) OTS price $3.60

Raytheon Co., Portsmouth, R. I.
APPLICATION OF TECHNIQUES OF STATISTICAL COMMUNICATION THEORY IN UNDERWATER ACOUSTICS.
Quarterly status rept. no. 2 for Sep 61.
Sep 61, 32p. incl. illus. (Rept. no. R155)
(Contract Nonr-338100)
Unclassified report

DESCRIPTORS: (*Sonar, Underwater sound, *Underwater sound transmission, Acoustics, Sonar signals, Signal-to-noise ratio, Detection, Communications theory.) (Acoustic detectors, Hydrophones, Detectors, Acoustic filters, Effectiveness, Matrix algebra, Integral equations, Mathematical analysis, Statistical processes.)

Research is concerned with analytical solutions of selected passive sonar problems by use of the techniques of statistical communication theory. Specific problems presently being investigated are: (1) The characteristics of the adaptive nonparametric-type detector functional when used.

to detect both gaussian and non-gaussian signals in either gaussian or non-gaussian noise; (2) The characteristics of the detector for noise-like signals in the presence of impulse-type background noise; and (3) The optimum use, from a detection decision standpoint, of the acoustic information available from a hydrophone array. The practical implementation of the adaptive detector was considered. A design was obtained which could process 1000 data samples and 3000 noise samples taken at a 2-kc rate, in real time. The detector outputs would be available with 1/2 sec of the epoch of the final data sample. A research report describing the status of the analysis on optimal array detection systems is appended to this report. (Author)

AD-266 185 Div. 6, 25
(TIPTP/GRW) OTS price $7.60

Scientific Planning Associates Corp., Silver Spring, Md.
CLOUD TRANSMISSION OF INFRARED RADIATION,
by Donald A. Melnick and Daniel J. Ross. 1 Sep 60, 66p. incl. illus. tables, 14 refs.
(Scientific rept. no. 1)
(Contract AF 19(604)4992)
(AFCRL TN 60-654) Unclassified report

DESCRIPTORS: (*Clouds, *Infrared radiation, *Wave transmission, Absorption, Scattering.) (*Target position indicators, Aerial targets, Surface targets, Detection, Infrared tracking, Effectiveness.)

An analysis is made to determine the percentage transmission of infrared energy by a cloud layer and to describe the angular distribution of the transmitted energy. The numerical analysis is limited to radiation in the 3 to 5 micron band, but the method is applicable to radiation in other bands. Many problem areas exist in which it is necessary to know the atmospheric transmission of infrared energy. Such areas include the surveillance of enemy activities, the detection and tracking of targets, and the guidance of friendly weapons. For each of these problem areas, it is necessary to know if useful amounts of infrared energy are transmitted. (Author)

AD-266 191 Div. 6, 8
(TIPTE/NTM) OTS price $1.10

Texas Instruments, Inc., Dallas.
RADIO RECEIVER R-1047/A.
Interim rept. no. 1, 15 Feb-15 Apr 61.
15 Apr 61, 6p. incl. illus. (Rept. no. 63204-1)
(Contract NOa(s) 60-0152)
Unclassified report

DESCRIPTORS: (*Radio receivers, Direction finding, *Miniature electronic equipment, Transistors, Very high frequency, Airborne, Design.) (Electronic circuits, Oscillator circuits.) (Noise (Radio), Measurement.) (Radio sonobuoys, Homing devices.)

A miniaturized, multiple-channel, high-gain, VHF receiver with the specified noise figure, and image and i.f. rejection requirements was developed utilizing subminiature components, special packaging techniques, AGC action, and single oscillator, double conversion techniques. Because this degree utilization of transistors in a VHF receiver is a near state of the art endeavor, special effort was required to refine the basic circuitry within a severely restricted volume. (Author)

AD-266 241 Div. 6, 12
(TIPTE/RD) OTS price $1.60

RCA Defense Electronic Products, Moorestown, N. J.
S-BAND TELEMETRY SUBSYSTEM FOR INSTRUMENTATION RADAR SET AN/FPS-16.
Interim progress rept. no. 3, 1 Apr 60-31 Jan 61. 31 Mar 61, 12p. (Rept. no. 5671-3)
(Contract NOa(s) 59-6181-c)
Unclassified report

DESCRIPTORS: (*Telemeter systems, Telemetering receivers, S band, Design.) (Radar equipment, *Radar tracking, Telemeter systems.) (Intermediate frequency amplifiers, Discriminators, Crystal mixers, Radiofrequency oscillators, Radar antennas.) (Guided missile tracking systems, Guided missile trajectories.)

Continued research is presented on the design, development and fabrication of an S-Band Telemetering Subsystem to be used with Radar Set AN/FPS-16. The final design of the components comprising the telemetry receiver and antenna system was completed. Final models of all receiver chassis and of the antenna were produced. Satisfactory tests of the receiver and antenna systems were conducted. (Author)

AD-266 293 Div. 6, 31
(TIPTB/MS) OTS price $1.60

Naval Supply Research and Development Facility, Bayonne, N. J.
DEVELOPMENT OF IMPROVED SIGNAL FLAGS SHIPBOARD EVALUATION,
by Franz Merz, Jr. and Edward Cherowbrier.
Sep 61, 13p. incl. tables (Clothing and Textile Division rept. no. 67)
(Proj. SR70901) Unclassified report

DESCRIPTORS: (*Visual signals, Shipborne, Materials, Textiles, Cotton, Plastics, Physical properties, Visibility.)

A shipboard evaluation of experimental signal flags was conducted to determine improvements in long range visibility characteristics, as compared to the standard cotton bunting flags presently used by the Fleet. Fluorescent dyed acetate sharkskin flags which have the visibility range desired but are unsuitable because of poor colorfastness and durability were also used as controls. Results showed experimental flags fabricated of Acrilan, dyed with selected dyestuffs, to be superior to the standard bunting and comparable to the fluorescent dyed flags. (Author)

AD-266 357 Div. 6
(TIPTW/DLW) OTS price $10.50

ITT Federal Labs., Nutley, N. J.
IMPROVED HF/MF DIRECTION FINDER SET.
Final rept. June 58-Sep 60,
by C. S. Bednash, V. F. Clifford and others.
Oct 60, 137p. incl. illus.
(Contract DA 36-039-sc-78079, Proj. 3-44-02-528)
Unclassified report

DESCRIPTORS: (*Direction finding, Direction finding stations, High frequency, Medium frequency, *Radio receivers, Radio signals, Bearing finding, Angle of arrival, Antennas, Goniometers, Display systems, Automatic, *Radio interception, Design, Tests.)

The design and fabrication of an improved direction finder set operating in the frequency range of 0.54 to 30 mc is described. The specified method of approach called for modification of existing components of direction finder set AN/TRD-4A to meet improved performance requirements. The work consisted mainly of modifications to the antenna system, goniometers, goniometer drive, and visual azimuth indicator, as well as providing a facility for semi-automatic bearing readout, and adding a second DF operating position. In addition, console type operating positions were substituted for the standard rack type, and the target transmitter was redesigned. A discussion is included of the operation and final testing of the improved HF-MF direction finder set. (Author)

AD-266 396 Div. 6
(TIPTW/RD) OTS price $19.75

Radio Corp. of America, Moorestown, N. J.
TRADEX INSTRUMENTATION RADAR SYSTEM.
Semi-annual technical summary rept. for period ending 31 Dec 60,
15 Jan 61, 306p. incl. illus. tables.
(Contract DA 36-034-ORD-3063)
Unclassified report

DESCRIPTORS: (*Radar equipment, Ultra high frequency, *Radar tracking, *Search radar, *Doppler tracking.) (Radar transmitters, Ultra high frequency, L band.) (Digital recording systems, Disk recording systems, Magnetic recording systems.) (Servo systems, Automatic volume control.) (Radar stations, Cooling.)

The TRADEX radar system is discussed. It will provide the means by which phenomenological or parametric information can be gathered on all elements of a target. With high resolution obtained by means of a large antenna aperture, wide-band range tracking, and narrow-band doppler tracking; precise and accurate data may be obtained regarding individual target size, shape, and translational and rotational velocity and acceleration. (Author)

AD-266 450 Div. 6
(TIPTW/DLW) OTS price $2.60

Bendix Corp., Detroit, Mich.
RESEARCH ON SOUND REFLECTING AND SCATTERING SYSTEMS,
Final Technical rept.,
by K. Walther. 20 Nov 61, 26p. incl. illus. table (Rept. no. 1972)
(Contract Nonr-342500, Proj. NR 385-544)
Unclassified report

DESCRIPTORS: (*Sound, Audiofrequency, Auditory signals, Reflectors, Reflection, Scattering, Acoustics, Acoustic waveguides, Tests, Effectiveness.) (*Sonar signals, Reflection, Feasibility studies.) (Lens antennas, Conical antennas, Antenna horns, Radar corner reflectors.)

Model experiments on backscattering diagrams of acoustic van Atta-reflectors are reported. Airborne sound waves in the frequency range between 2.5 and 9.0 kc were used for measurement. The acoustic van Atta-array consists of 36 conical horns (aperture 1-1/2 in), arranged on a 9 x 9 sq in. flat surface. The required acoustic transmission lines for connecting the horns are realized by plastic tubing with reinforced walls. The van Atta-reflector showed a wider angular coverage than the conventional corner reflector in the frequency range between 2.5 and 6.0 kc. For higher frequencies the angular coverage was limited by the directivity of the horns. Some tests on an assembly of 2 reflectors, mounted at an angle of 60 degrees with respect to each other, are reported which show a superior response as compared to a cluster of corner reflectors in the frequency range from 2.5 to 5.0 kc. (Author)

AD-266 473 Div. 6
(TIPTW/EET) OTS price $1.10

Navy Underwater Sound Reference Lab., Orlando, Fla.
TWENTY YEARS OF SONAR CALIBRATION METHODS,
by Robert J. Bobber. 15 Nov 61, 8p. 61 refs.
(USRL Research rept. no. 56)
Unclassified report

DESCRIPTORS: (*Electroacoustic transducers, *Hydrophones, Calibration, Transducers, Design.) (*Sonar equipment, *Calibration.)

In 1941, there existed a negligible capability for anyone to calibrate an underwater sound transducer. With the invention of the reciprocity method of calibration and the impetus provided by World War II, the art and science of sonar calibration methods developed rapidly. During the years after World War II, the theory and practice of calibration methods have become ever broader in scope. A chronology of this development from 1941 to 1961, and the role of the Navy Underwater Sound Reference Laboratory in it, is presented. (Author)

AD-266 529 Div. 6
(TIPTE/CRJ) OTS price $7.60

Hazeltine Technical Development Center, Inc., Indianapolis, Ind.
A STUDY OF DISPLAY SYSTEMS FOR USE IN THE AUGMENTED 4-WHEELS PROJECT.
Final rept.,
by Roy C. Fights, Tirey K. Vickers, and William E. Miller. July 61, 72p. incl. illus. tables.
(Contract AF 19(604)7986)
(AFCRL-753) Unclassified report

DESCRIPTORS: (*Display systems, *Plan position indicators, *Cathode ray tubes, *Search radar, *Ground controlled approach radar, *Identification systems, *Direction finding, Design.) Radar equipment.

The results are presented of an investigation of available display equipment for possible use in an air transportable, air traffic control and communication system. Various display techniques and associated equipment are analyzed with respect to the requirements of this system. Specific equipments, in the following categories, are described and analyzed: (1) horizontal PPI console, (2) small plan position indicator, (3) AZ-EL indicator, (4) symbol generation system, and (5) method of displaying flight plan data. One particular display equipment from each of the above categories is recommended. (Author)

AD-266 663 Div. 6, 26
(TIPTW/EET) OTS price $1.60

Servo Corp. of America, Hicksville, N. Y.
INDUSTRIAL PREPAREDNESS MEASURE FOR THERMISTOR BOLOMETER INFRARED DETECTORS.
Quarterly progress rept. no. 9, 27 June-26 Sep 61,
by Irving M. Meltzer. 26 Sep 61, 6p. incl. tables (Rept. no. SCA 10300-RQ-9)
(Contract DA 36-039-sc-81288)
Unclassified report

DESCRIPTORS: (*Infrared detectors, Production, Processing, Manufacturing methods.) (*Bolometers, Thermistors, Infrared equipment, Design, Tests.) Quality control.

Continued progress is reported on the development of infrared detectors. Delivery of 138 bolometers was made in two submissions. The major cause of delay of the balance has been extensive rework of the IR-107 series due to the tight time constant tolerance. (Author)

AD-266 706 Div. 6
(TIPTW/JRG) OTS price $3.60

Naval Ordnance Lab., White Oak, Md.
RATE COMPENSATING TRACKER WOX-2A,
by C. R. Greene, C. N. Pryor, and J. C. Munson.
July 61, 13p. illus. (Rept. no. NOLTR 61-37)
Unclassified report

DESCRIPTORS: (*Sonar, Bearing finding, Range finding, *Tracking, Sonar targets, Shipborne, (Data processing systems, Fire control systems, *Correlation techniques, Theory.)

An automatic tracker was built to follow the position of the maximum of a correlation function generated by a DELTIC correlator. The position-correcting decisions, made for each successive correlogram, are of a fixed size (0.8 microsec); the direction is determined by the polarity of the error signal formed by comparing the tracker position with the position of the new correlogram. This is similar to the WOX-1A tracker, except that the WOX-2A is digital. This tracker includes a rate tracking capability so that a correlogram whose position changes at a constant rate (up to 28.2 microsec/sec) may be tracked without lag. A direct readout of the correlogram rate of change of position is provided. Theoretical analysis shows that with such rate compensation the tracker performance approximates that of the uncompensated tracker for input standard deviations up to about 300 microsec, in addition to eliminating the lag. Beyond that, the tracker output variations increase and there is some tendency to oscillate. (Author)

AD-266 995 Div. 6, 8, 30
(TIPTE/CDM) OTS price $1.60

Radiation, Inc., Melbourne, Fla.
TELEMETRY TRANSDUCER HANDBOOK.
Monthly progress rept. no. 6, 15 Oct-15 Nov 61,
by H. F. Fisher, Jr. 21 Nov 61, 17p.
(Contract AF 33(616)8309, Proj. 4107)
Unclassified report

DESCRIPTORS: (Handbooks, *Telemeter systems, *Transducers.) (Instrumentation, Calibration, Test methods, *Test facilities.)

AD-267 087 Div. 6, 8
(TIPTW/DLW) OTS price $10.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
STUDIES AND INVESTIGATIONS LEADING TO THE DESIGN OF A RADIO DIRECTION FINDER SYSTEM FOR THE MF-HF-VHF RANGE.
Final rept. 26 June 59-30 June 61,
by A. D. Bailey, E. C. Hayden, and J. D. Dyson.
31 July 61, 125p. incl. illus. tables, 38 refs.
(Contract DA 36-039-sc-84525)
Unclassified report

DESCRIPTORS: (*Direction finding, Medium frequency, High frequency, Very high frequency, Radio signals, Angle of arrival, Radio interception, Phase measurement, Doppler systems, Design.) (Radio waves, Ionospheric propagation, Propagation, Analysis.) (Radio receivers, Antennas, Radio interferometers, Loop antennas, Switching circuits, Conical antennas, Electronic circuits, Radio equipment, Design.) (Data processing systems, Display systems, Analog computers, Tests.)

Research concerns the design of a radio direction finding system for the MF-HF-VHF range. Instrumentation for the propagation research task was completed. A wide-base amplitude comparison system using the beverage antenna as the directive element was constructed. Radio direction finder systems of the wide-base phase comparison type were proposed as having the properties which are needed for this investigation. Certain novel techniques in radio direction finding were developed. Results and recommendations are given in sufficient detail to permit their duplication. (Author)

7. ELECTRICAL EQUIPMENT

AD-266 103 Div. 7, 4
(TIPTM/TCG) OTS price $1.10

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
REDOX FUEL CELLS.
Quarterly progress rept. no. 6, 1 June-1 Sep 61,
by L. G. Austin. 1 Sep 61, 4p.
(Contract DA 49-186-502-ORD-917)
Unclassified report

DESCRIPTORS: (*Fuel cells, Oxidation-reduction reactions, Quantitative analysis of *Tin compounds, Oxides, Ions by Reduction with Lead in Sulfuric acid on Formaldehyde in Hydrochloric acid, Solutions, Carbon dioxide, Controlled atmospheres, Test methods.) (Hazards, Explosions of Gases.) *Power supplies, Electrochemistry.

An analytical procedure was developed for determining Sn(++), but it has not been possible to determine Sn(4+) ion in the presence of Sn(++), or to quantitatively reduce Sn(4+) to Sn(++) by means of the Jones reductor. At temperatures below the normal boiling point, no reduction of Sn(4+) to Sn(++) is obtained with HCHO as the reducing agent, in concentrated HCl solutions. At 200 C, a high pressure build-up occurs in the reaction tubes; on breaking the tubes, the pressure release is so violent that it is difficult to collect the sample. Although this may be invalidating the results, no reduction of Sn(4+) to Sn(++) was observed. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-266 153 Div. 7, 26
(TIPTM/BRW) OTS price $1.60

Sprague Electric Co., North Adams, Mass.
INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERIES.
Quarterly rept. no. 11, 1 July-30 Sep 61, by S. B. Williams and A. G. Ceely. 30 Sep 61, 15p. incl. tables.
(Contract DA 36-039-sc-81251)
Unclassified report

DESCRIPTORS: (*Dry cells, Primary batteries, Solids, Electrolytes, Design.) (Manufacturing methods, Automation, Industrial equipment, Design, Production, Scheduling, Quality control, Industrial production.)

Qualification testing was successfully completed. Various specification changes are described, including a new size requirement for the battery. A problem of substandard low-temperature readings was solved by adjusting the content of the cathode mix. A general description of cell assembly equipment is given. (Author)

AD-266 159 Div. 7, 26
(TIPTE/NTM) OTS price $1.60

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR SUBMINIATURE TEMPERATURE-COMPENSATING CERAMIC CAPACITORS.
Quarterly rept. no. 1, 12 June-12 Sep 61, by J. H. Fabricius and W. F. Bell. 12 Sep 61, 18p. incl. tables.
(Contract DA 36-039-sc-85996)
Unclassified report

DESCRIPTORS: (*Ceramic capacitors, *Subminiature electrical equipment, Materials, *Manufacturing methods, Production, Life expectancy.) (Miniature electrical equipment, Capacitors, Ceramic materials, Dielectrics, Sprays, Binders, Coatings.)

Efforts are being made to establish facilities and competence to produce subminiature temperature-compensating ceramic capacitors. Progress toward selecting formulations for use in the capacitors is described. Areas of difficulty currently being examined are temperature coefficient of capacitance for the NPO and N1400 formulations and the life performance of units made with the N750 formulation. Steady progress is reported in the selection of sprayable binders, the development of spraying capability, and the fabrication of a slicing tool. Steps are being taken to eliminate a flaking off problem with the ceramic dip coat. The nail-head type of lead appears best suited for these units. (Author)

AD-266 220 Div. 7, 25
(TIPTM/TCG) OTS price $2.60

Westinghouse Electric Corp., Pittsburgh, Pa.
THERMOELECTRICITY.
Quarterly progress rept. no. 1, 1 Apr-1 Aug 61. 1 Aug 61, 25p. 13 refs.
(Contract NObs-84687)
Unclassified report

DESCRIPTORS: (*Thermoelectricty, *Semiconductors, Effectiveness of Theory, Corrections on Electrical properties, Electrical conductance.) (Electrons, Transport properties of Mixtures of Valence, Conductors, Impurities, Conductivity, Ferromagnetism, Thermodynamics, Resistance, Measurements.) (Materials, *Lanthanum compounds, Calcium compounds, Manganates.) (*Transition elements, Metals, Oxides.)

This report includes:
THEORETICAL REQUIREMENTS FOR THERMOELECTRIC MATERIALS, by P. G. Klemens. 12 July 61 (Research rept. no. 929-8904-R2). The thermoelectric properties of a solid are determined by the functional form of Sigma(E), the electrical conductivity of electrons of energy E. In order for the Seebeck coefficient to be high, Sigma(E) must vary rapidly over a narrow energy range. Possible methods of realizing this condition are discussed. (Author)

MODEL FOR THE ELECTRONIC TRANSPORT PROPERTIES OF MIXED VALENCY SEMICONDUCTORS, by R. C. Miller, R. R. Heikes, and R. Mazelsky. 27 June 61, (Scientific paper no. 929-8904-P1). It is shown that the simple hopping model for the transport processes of mixed valency semiconductors is inadequate for impurity concentrations approximately greater than 1%. (Author)

AD-266 308 Div. 7, 15
(TIPTP/JDP) OTS price $7.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE DESIGN OF NONLINEAR AND ADAPTIVE SYSTEMS VIA LYAPUNOV'S SECOND METHOD,
by Lawrence P. Grayson. 27 July 61, 71p. incl. illus. tables, 24 refs. (Rept. no. PIBMRI-937-61)
(Contract DA 30-069-ORD-1560)
(AROD Rept. no. 1538:19)
Unclassified report

DESCRIPTORS: (*Servo systems, Control systems, Synthesis, Special functions.) (*Nonlinear systems, Control systems, Synthesis, Special functions.)

The second method of Lyapunov is investigated and utilized in synthesizing nonlinear and adaptive controllers for single-input-single-output, as well as multidimensional, processes. New design procedures from the existing theorems are obtained. The procedures are presented for the general case, examples are given to illustrate the theory, and computer results are shown to indicate how well the controlled systems operate. (Author)

AD-266 351 Div. 7, 12
(TIPTM/EJH) OTS price $3.00

Delco-Remy Div., General Motors Corp., Anderson, Ind.
SILVER OXIDE-ZINC BATTERY PROGRAM.
Rept. 30 June-31 Oct 60, by John Rhyne, Jr. May 61, 152p. incl. illus. tables, 223 refs.
(Contract AF 33(600)41600, Proj. NR 3145)
(WADD TR 61-36) Unclassified report

DESCRIPTORS: (*Storage batteries, *Electrolytic cells, *Wet cells, Design, Materials, Operation.) (Electrodes, Silver compounds, Oxides, Zinc.) (Electrolytes, Potassium compounds, Hydroxides.) (Electrochemistry, Gases, Pressure, Voltage, Electric currents.) (Containers, Packaging, Seals, Plastic seals, Membranes, Plastics.) (Spaceships, Satellite vehicles, Electric power production.) Bibliography.

A study was made of the Ag ion migration within the cell during cycling. Distribution of Ag in the various layers of separator was determined as a function of the number of cycles. A comprehensive study of the Zn electrode was partially completed. The effect of current density and certain addition materials was determined in terms of Zn particle size increase during cycling. Methods of controlling Zn penetration of the separator material were established. Other investigations included gas producing reactions at both the negative and positive plates, pressure control, effect of alloying elements on the voltage characteristics of the positive plate, production of a molded terminal seal resistant to KOH leakage. A sealed cell was constructed and cycled over a 20% capacity range for 590 cycles. The pressure change was from a 10 psi vacuum to a 9 psi positive pressure.

AD-266 400 Div. 7, 26
(TIPTE/NTM) OTS price $1.60

Ray-O-Vac Co., Madison, Wis.
LOW TEMPERATURE BA-2270/U-XLT-I BATTERIES.
Interim rept. no. 3, 15 Feb-15 Aug 61,
by J. W. Paulson. 15 Aug 61, 11p. tables.
(Contract DA 36-039-sc-78144)
Unclassified report

DESCRIPTORS: (*Low temperature batteries, *Storage batteries, *Dry cells, Production, Tests.) (Lithium compounds, Chlorides, Bromides, *Electrolytes, Test equipment, Battery separators, Life expectancy.)

Twelve months delayed performance tests results are reported for in-plant testing of production batteries at -40 F, -20 F and 70 F. The lithium chloride electrolyte was employed in combination with a separator designated as CP-2 paper. Batteries were stored at both 35 F and 70 F. (Author)

AD-266 441 Div. 7, 4
(TIPTW/RD) OTS price $1.10

Aerospace Corp., El Segundo, Calif.
FUEL CELL RESEARCH PROGRAM. CHLORINE-PHOSPHORUS TRICHLORIDE FUEL CELL INVESTIGATIONS.
Semiannual technical rept., 1 Jan-30 June 61,
by F. Hess and L. Schieler. 30 June 61, 4p.
(Rept. no. TDR-594(1201-01)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Fuel cells, Design.) (Electric power production, Space flight.) (Electrochemistry, Phosphorus compounds, Chlorides, Dissociation, Photolysis, Chemical reactions.)

A description is given of a fuel cell research program for space power applications. The primary objective of the program is the investigation of a regenerable fuel cell utilizing the thermal or photolytic dissociation of phosphorus pentachloride to phosphorus trichloride and chlorine as a source of chemical energy. Data reveal that thermal dissociation is feasible but photolysis techniques will need further study. Theoretical background is given for electrode reactions of the phosphorus trichloride-chlorine fuel cell and the technical progress made in this investigation during the last six months is summarized. (Author)

AD-266 552 Div. 7
(TIPTE/CDM) OTS price $5.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
A DESIGN STUDY OF A SMALL HOMOPOLAR MOTOR,
by George J. Bukow. Jan 61, 46p. incl. illus. tables, 44 refs. (Rept. no. DSR 7672)
(Contract AF 33(616)7624, Proj. NR 0(2-8128)
(ASD TR 61-101) Unclassified report

DESCRIPTORS: (*Electric motors for Liquid metal pumps.) (Thermoelectricity, *Generators, Design, Tests, Direct current.) (Liquid metals, Brushes.)

The characteristics of a small homopolar motor are examined in detail with special emphasis given to optimizing liquid metal brush designs. A detailed account is given of tests conducted with an experimental brush rig to determine the effect of various parameters on hydraulic friction loss and to investigate stability and contact characteristics. The conclusions gained from these tests are used to design a liquid metal brush for the proposed motor. Use is made of a theoretical design procedure that minimizes the total power loss in the motor for a given power output and speed of operation. The parameters obtained for an operating speed of 900 rpm and a nominal power output of 1 kw are used in the design presented. The voltage and current ratings are 0.450 volts and 2340 amps, respectively, and an efficiency of 84% is predicted. (Author)

AD-266 598 Div. 7, 8, 25
(TIPTP/JW) OTS price $1.60

Naval Research Lab., Washington, D. C.
A METHOD OF IMPROVING THE HEAT TRANSFER IN RIGID COAXIAL LINES.
Interim rept.,
by J. Burkett. 27 Oct 61, 10p. (NRL rept. no. 5703)
(Proj. no. NO 00-030-566-1/S434-00-000)
Unclassified report

DESCRIPTORS: (*Coaxial cables, Temperature, *Electrical properties, *Power, Heat transfer, Pressure, Conductors.) (*Coaxial cables, Heat, Reduction, Paints, Zinc compounds, Chromates.) (*Coaxial cables, Air, Helium, Pressure.)

In an all-copper 50-ohm coaxial line, approximately 70 percent of the power losses occur in the inner conductor. With high-power lines the temperature rise of the inner conductor may limit the power capability of the line. It was determined that the heat transfer from inner to outer conductor can be improved by a factor of nearly five for a 100 C inner conductor temperature and 0 C outer conductor temperature by painting the inner and outer conductors. Further improvement, to a factor of seven, can be obtained by using helium instead of air for pressurization. The increase in attenuation due to zinc chromate paint was less than 0.01 db per hundred feet on 3-1/8-inch-diameter line at 108 Mc. (Author)

AD-266 606 Div. 7, 8
(TIPTE/RD) OTS price $3.60

Naval Ordnance Lab., Corona, Calif.
OPTIMUM SERVO PERFORMANCE IN A NOISE ENVIRONMENT,

by J. J. Dow and R. D. Orr. July 61, 35p. incl. illus. (Technical memo. no. 74-138)
Unclassified report

DESCRIPTORS: *Servo systems, *Servomechanisms, Mathematical analysis, Signal-to-noise ratio.

A mathematical analysis is presented for Type I and Type II servo systems when subjected to a gated input consisting of a signal, plus random noise which is evenly distributed across the gate width. The analysis considers, in order, the response of Type I and Type II servos for signal-only input; the response of Type II servos for noise-only input; the response of Type I and Type II servos for signal-plus-noise input; and the derivation of probability equations. The probability is determined that, at any instant of time after the addition of the noise, the servo output (gate center) and the signal will be separated by more than one-half the gate width (resulting in a break in tracking). A procedure is given for choosing servo parameters to minemizethis probability. (Author)

AD-266 729 Div. 7
(TIPTM/LSK) OTS price $6.60

Westinghouse Electric Co., Elmira, N. Y.
FISSION HEAT DIODE CONVERTER.
Rept. for 7 Mar 60-30 Apr 61,
by Gene R. Feaster, M. Gottlieb, and R. J. Zollweg. July 61, 57p. incl. illus. tables.
(Contract AF 33(616)7198)
(ASD TR 61-281)
Unclassified report

DESCRIPTORS: (Auxiliary power plants, *Electric power production, Power supplies, Sources, Spaceships.) (*Cesium, Vapors, *Diodes, Thermionic emission, Adsorption, Tungsten, Plasma oscillations, Thermal conductivity, Electrons, Scattering.)

Thermionic conversion of fission heat using cesium vapor diodes offers promise as an electrical power source for space vehicles. Research and development work on cesium vapor diodes is reported, as well as a state-of-the-art survey and an extensive bibliography. Experimental and/or theoretical results are given in the following areas: effect of gas adsorption on the emission from cesiated tungsten; plasma oscillations; thermal conductivity of cesium vapor; electron scattering in cesium vapor; effect of varying cesium pressure, cathode temperature, and spacing in a cesium cell; and construction techniques and materials problems. The use of plasma oscillations to generate alternating current is discussed briefly and an analysis showing that the use of hybrid thermionic-thermoelectric systems in space is not favorable, is shown. (Author)

AD-266 755 Div. 7
(TIPTW/RD) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ELECTRICITY - BORN IN FLAME (Elektrichestvo, Rozhdennoye V Plameni),
by V. Kostrov. 31 Oct 61, 8p. incl. illus.
(Trans. no. FTD-TT-61-73 of Tekhnika Molodezhi, Issue no. 1:2-4, 1961)
Unclassified report

DESCRIPTORS: (Technological intelligence, USSR, Translations.) (Ion rockets, *Electric power production, *Thermoelectricity, Generators, Semiconductors, Thermionic emission, *Fuel cells.) (Plasma physics, Magnetohydrodynamics, Gas ionization.)

AD-266 757 Div. 7, 8, 6
(TIPTW/RD) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ON THE OPERATIONAL RELIABILITY OF TELEMECHANICS DEVICES (O Nadezhnosti Raboty Ustroystv Telemekhaniki),
by N. S. Shabalin. 1 Nov 61, 6p. incl. illus. table (Trans. no. FTD-TT-61-142 of Elektrichestvo, Issue no. 6:pp. 91-93, 1960)
Unclassified report

DESCRIPTORS: (Technological intelligence, USSR, Translations.) (*Telemetering, Reliability.) (Electronic equipment, Electrical equipment, Reliability.) (*Control systems, *Remote control systems. Reliability.)

AD-266 770 Div. 7
(TIPTE/CDM) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AUTOMATIC MAINTENANCE OF THE VOLTAGE OF A DIRECT-CURRENT GENERATOR WITH THE AID OF A SATURATION CHOKE COIL,
by K. I. Krayniy, V. T. Polyakov, and B. V. Trubachev. 2 Nov 61, 6p. incl. illus. (Trans. no. MCL-1346 of Promyshlennaya Energetika 5: 23-25, 1960)
Unclassified report

DESCRIPTORS: (USSR, Technological intelligence, Translations.) (*Generators, Direct current, Control systems, Automatic.) (*Coils, *Voltage regulators, Selenium rectifiers, Tests, Mathematical analysis.)

An investigation was made of a saturation choke coil used to maintain a given voltage on a dc generator of type PN-75, which has a power output of 75 kw, a rotational velocity of 1500 rpm, a voltage of 440 v, and is driven by an asynchroous motor. The generator operated under unequal load conditions from 0 to 200 amp, i.e., brief current overloads of 40% occur. Such operating conditions caused sharp voltage oscillations and thus lead to a temporary disturbance of the technological process. Manual voltage control required great attention on the part of the maintenance personnel. The external characteristics with and without the saturation choke coil are presented. (Author)

AD-266 797 Div. 7, 8
(TIPTE/NTM) OTS price $2.60

Hi-Q Div., Aerovox Corp., Olean, N. Y.
PRODUCTION ENGINEERING MEASURE FOR ROLLED CERAMIC CAPACITORS:
Quarterly rept. no. 1, 9 June-9 Sep 61,
by J. D. Cronin. 9 Sep 61, 30p.
(Contract DA 36-039-sc-85963)
Unclassified report

DESCRIPTORS: (*Ceramic capacitors, Design, *Manufacturing methods, Model tests, Test equipment.) (Textiles, Dielectrics, Wire winding machines, Capacitors, Engineering Production.)

Efforts are being made to establish the capability to manufacture rolled ceramic capacitors by mass production techniques and facilities, and to produce and test preproduction and pilot run

quantities of rolled ceramic capacitors. Emphasis was placed upon the equipment needing the most engineering – the dielectric casting machine and the winding machine. Experimental work proved the feasibility of continuous casting of the dielectric sheet, and a machine is being designed to accomplish this. A winding machine is being constructed which will wind the Cerols quickly and efficiently. (Author)

AD-266 914 Div. 7, 8, 15
(TIPTP/WH) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
INPUT IMPEDANCES FOR THE NON-UNIFORM 2n WIRE TRANSMISSION LINE,
by Irving Kay. Aug 61, 26p. (MRC Technical summary rept. no. 252)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Transmission lines, *Electrical networks, Impedance.) (Differential equations, Vector analysis, Mathematical analysis.)

AD-267 005 Div. 7, 8, 30
(TIPTE/CDM) OTS price $5.60

Stanford Research Inst., Menlo Park, Calif.
AUTOMATIC FAULT DETECTION IN COMBINATIONAL SWITCHING NETWORKS,
by William H. Kautz. Apr 61, 48p. incl. illus.
(Technical rept. no. 1)
(Subcontract to Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena, Calif., Contract NASw-6)
Unclassified report

DESCRIPTORS: (*Electrical networks, *Switching circuits, Failure (Mechanics), Automatic, Detection, Test methods, Errors.) (*Digital systems, Reliability, Circuit testers, Design, Mathematical analysis.) (Coding, Computers.) (Electric switches, Electronic switches, Relays.)

A study was made of the logical design of economical combinational switching networks which contain sufficient redundancy so that the presence of any single fault can be detected. Within broad limits any isolated fault in a single-output network may be detected with about 2:1 redundancy, through duplication of the irredundant network, and the addition of a comparator gate. A reduction of the redundancy ratio below 2:1 is shown to be usually possible. Branch-type networks-e.g., those made up of relay contacts or cryotrons instead of gate-type elements-are also considered. If the designer is free to use some non-branch-type elements in the detection circuitry, the same low redundancy ratios achievable in gate-type circuitry can be obtained here. Finally, several examples in application areas of importance in conventional digital systems are discussed, including some comparators, calculating networks, code converters, and decoding trees. (Author)

AD-267 023 Div. 7, 8
(TIPTE/NTM) OTS price $4.60

General Electric Co., Schenectady, N. Y.
50 KV PULSE CABLE ASSEMBLIES.
Quarterly progress rept. no. 1, 1 July-1 Oct 61, by W. T. Starr. 25 Oct 61, 44p. illus. tables.
(Contract DA 36-039-sc-88974)
Unclassified report

DESCRIPTORS: (*Pulse cables, *Power supplies, Radar equipment, Measurement, Temperature, Heating, Mathematical analysis, Dielectrics, Conductors, Butyl rubber, Life expectancy, Frequency, Test methods, Electrical corona.) (Silver, Paints, Heat, Stability.) Design.

Pulse cable with higher pulse voltage rating and higher power capability is needed to meet the voltage and power requirements of associated high power radar equipment. Efforts are being made to provide the test information required to assign a voltage rating to RG-191/U and to establish detailed design and constructional features for a 50 kv pulse cable. It is further proposed, in case RG-191/U is satisfactory for 50 kv rating, to test RG-191/U cable with high voltage connectors. Measurements of temperature and temperature distribution were made on RG-191/U cable with conductor heating and with dielectric heating. Analysis of these data indicates that the effects of these 2 heat sources on life should be very similar at the same total power dissipation. Initial life data are given on a small specimen (50 ft.) of Lot #1 of RG-191/U at 35 kv rms, 10,000 c. The only failures thus far are end failures at life times exceeding 330 hours. The variation of the number of electrical discharges per foot of cable with voltage is reported. An investigation of the heat stability of silver paint is reported. Termination techniques are discussed. (Author)

AD-267 051 Div. 7
(TIPTM/BRW) OTS price $2.00

Inland Testing Labs., Dayton, Ohio.
ALKALINE BATTERY EVALUATION.
Rept. for 30 June 60-15 Apr 61,
by I. F. Luke, W. G. Ingling, and W. W. Clark.
Oct 61, 70p. incl. illus. tables.
(Contract AF 33(616)7529, Proj. 3145)
(ASD TR 61-236) Unclassified report

DESCRIPTORS: (*Alkaline cells, Wet cells, Storage batteries for Spaceships, Satellite vehicles.) (Anodes (Electrolytic cells), Cadmium compounds, Hydroxides.) (Cathodes (Electrolytic cells), Nickel compounds, Hydroxides.) (Battery separators, Cellulose.) (Electric insulation, Ethylenes, Fluorides, Polymers, Nylon.) (Electrolytes, Potassium compounds, Hydroxides.) (Containers, Stainless steel, Magnesium.) (Seals, Rubber seals.) (Valves, Check valves.) (Design, Tests, Failure (Mechanics), Analysis.) (Cadmium, Nickel, Silver, Zinc.)

The report covers the first period of an alkaline battery applied research and failure analysis program to establish a broad base of battery test data for the design of electrical systems of future space vehicles. Another objective is to determine techniques and/or materials to prevent these failures while increasing the usable watt-hours-per-pound capability and cycle life of the battery. Cycle-life tests were conducted on 1 type of 12-amp-hr, sealed, Ni-Cd cell in 2 temperature environments and 4 depths of discharge. Initial results show that (1) cell cycle-life with shallow discharges is considerably longer than cycle-life at deep discharges, and (2) cycle-life is reduced by high ambient temperatures. The program will include as future work evaluation of Ag-Cd and Ag-Zn type cells. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-267 060 Div. 7, 4
(TIPTM/TCG) OTS price $2.75

Sunstrand Aviation-Denver, Pacoima, Calif.
A NITROSYL CHLORIDE SOLAR REGENERATIVE FUEL CELL SYSTEM.
Final Rept., Oct 60-May 61,
by W. E. McKee, E. Findl and others. July 61, 122p. incl. illus. tables.
(Contract AF 33(616)6585, Proj. 3145)
(WADD TR 60-821, pt. 2)
Unclassified report

DESCRIPTORS: (*Fuel cells, *Solar energy, Design, Regeneration by Dissociation, Photolysis of *Nitrogen compounds, Oxychlorides into Oxides, Chlorine, Separation by Solvent extraction, Halocarbons, Carbon, Graphite, Electrodes.) Photochemical reactions, Photochemistry, Electrochemistry.

Regeneration is accomplished utilizing solar energy to dissociate NOCl into NO and Cl. Product separation is accomplished by using solvent extraction techniques. The separated dissociation products are used as fuels in a C electrode, ambient temperature fuel cell. A breadboard model photoregeneration system was designed and built. Data are given relating to the model fabrication, preliminary system tests, separation of regenerated fuels, and the development of the NO-Cl fuel cell. Encouraging progress was made in the performance of the non-regenerated NO-Cl fuel cell. Current densities up to 8.5 amp/sq ft at about 75% of the theoretical cell voltage (0.21 v) were achieved. In preliminary system tests, solar energy was converted into electricity for the first time by a photochemically regenerated fuel cell system employing product separation. Although conversion efficiencies in these few tests were very low, the photochemical process for storing and converting solar energy has thus been demonstrated. (Author)

AD-267 073 Div. 7, 4
(TIPTM/TCG) OTS price $4.60

California Research Corp., Richmond.
INVESTIGATIVE STUDY RELATING TO FUEL CELLS.
Quarterly progress rept. no. 5, 26 Apr-25 Aug 61. 27 Oct 61, 47p. incl. illus. tables.
(Contract DA 49-186-502-ORD-929)
Unclassified report

DESCRIPTORS: (*Fuel cells, Chemical reactions, Electrodes, Reaction kinetics, Electrochemistry, Power supplies.) (Hydrocarbons, Hexanes, Ethanes, Propanes, Butanes, Butenes, Cyclohexanes, Hydrogen, Carbon dioxide, Acids, Hydroxides, Oxidation at Carbon, Anodes (Electrolytic cell), Polarization, Diffusion, Voltage.) (Adsorption, Nickel, Silicon compounds, Oxides, Surfaces.)

Studies of hydrocarbon oxidations at fuel cell anodes were extended. Erratic behavior resulted from poisoning by air and materials leached slowly from ion exchange membrane separators. The ratio of reactivities of H and hydrocarbons differed with different electrodes. Cyclohexane and n-hexane gave low orders of reactivity on platinized porous carbon anodes in 5N H_2SO_4 at 88 C. Gaseous hydrocarbons were more reactive, with C_2H_6, C_3H_8, C_4H_{10}, and 1-butene showing similar reactivities. When current is kept below a certain threshold value, prolonged operation is possible with very gradual polarization; when this threshold is exceeded, a rapid loss of activity occurs. Present temperature-effect data indicate some fuel cell activity with C_3H_8 at 30 to 40 C, increasing as the temperature is increased to 80 to 90 C. Calculations indicate the rates of diffusion of CO_2 from, and hydrocarbon to, the reaction zone in porous electrodes are rapid enough to support practical current densities. On replacing silica by graphite as the support, the available Ni surface was found to be markedly lower. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-266 101 Div. 8, 25, 12
(TIPTP/JW) OTS price $1.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
INVESTIGATION OF HIGH FREQUENCY PROPAGATION IN THE IONOSPHERE USING SATELLITE TRANSMISSIONS.
Quarterly status rept. no. 9, 15 July-15 Oct 61, by W. J. Ross. 15 Oct 61, 14p. incl. illus.
(Contract AF 33(616)6157)
Unclassified report

DESCRIPTORS: (Data transmission systems, Radio waves, Amplifiers.) (Scintillation counters, Polarization, Doppler systems.) (Satellite vehicles, Tracking.) (*Ionospheric propagation, Ionosphere.) (Satellite vehicles, *Radio signals, Very high frequency, Ionosphere.)

Studies of ionospheric radio propagation using the Transit 4A satellite with coherent beacons at 54 mc/s and 324 mc/s are reported. In addition to the mid-latitude observations of phase scintillation, amplitude scintillation, doppler dispersion and polarization rotation, a recording station near the magnetic equator provides additional dopper and polarization data. (Author)

AD-266 111 Div. 8
(TIPTE/NTM) OTS price $4.60

Radio Corp. of America, Harrison, N. J.
THE DESIGN AND DEVELOPMENT OF A ONE-HALF WATT HEATER POWER REDUCED SIZE NUVISTOR TRIODE.
Interim development rept. no. 4, 1 Apr-30 June 61,
by W. J. Helwig. 30 June 61, 39p. incl. illus. table.
(Contract NObsr-81478)
Unclassified report

DESCRIPTORS: (*Triodes, Ceramic materials, Electron tube heaters, Life expectancy, Electrical properties, Mechanical properties, Tests, Design.) (*Electron tubes, Electrodes, Nickel, Chromium, Nickel alloys, Chromium alloys.) (Cathodes, Capacitance bridges, Measurement.) (Microwave amplifiers, Electronic circuits.)

Design of the final version of the half size nuvistor designated as the developmental type A15274 was completed. A few initial samples of this tube were completed. Heater power input was fixed at 400 milliwatts and a 700 mc noise figure of 7.5 db is attainable at 400 milliwatts plate power input. Practical difficulties in grid fabrication delayed fabrication of sufficient tube samples for more complete electrical and mechanical testing. (Author)

AD-266 136 Div. 8
(TIPTE/CCD) OTS price $7.60

Radiation, Inc., Orlando, Fla.
AN ELECTRONIC SWITCHBOARD EMPLOYING NEGATIVE IMPEDANCE DEVICES.
Quarterly progress rept. no. 1, 1 June-31 Aug 61, by B. Grace, R. Johnson, and C. Baxter.
31 Aug 61, 71p. incl. illus. tables.
(Contract DA 36-039-sc-87245)
Unclassified report

DESCRIPTORS: (*Panel boards (Electricity), Electronic equipment, *Switching circuits, Negative resistance circuits, Electron circuits, Impedance, Automatic, Diodes, *Electronic switches, Solid state physics, Interference, Design, Multichannel telephone systems.)

Research concerns an electronic switchboard that performs switching functions with negative impedance devices. A 4-wire automatic switchboard employing negative impedance solid-state crosspoint switches in a multistage space division matrix will be designed to conform with the AN/TTC-12( ) and will include provision for priority and conference facilities. Actual size, weight, and power requirements of an AN/TTC-12( ) switchboard, constructed in accordance with the proposed techniques, will be determined. A skeletonized model of a multistage switching network using solid-state crosspoint devices will be fabricated so that tests can be made to prove the design. A 3-stage nonblocking matrix was studied and the combination of switches and contacts that would provide the minimum number of crosspoints for nonblocking between 280 input lines and 60 double ended links was calculated. A simulated experimental circuit was constructed and crosstalk attenuation was found to be 92.2 db. Three crosspoint devices were found acceptable, including the modified Hook circuit, Shockley diodes and Glassreed switches. (Author)

AD-266 141 Div. 8
(TIPTE/CDM) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
OSCILLISTOR DEVICE RESEARCH.
Quarterly rept. no. 2, 1 June-31 Aug 61, by R. D. Larrabee. 30 Sep 61, 30p. incl. illus. 11 refs.
(Contract DA 36-039-sc-87415)
Unclassified report

DESCRIPTORS: (*Crystal oscillators, Electric fields, Magnetic fields, Tests, Design.) (Oscillation, Theory, Mathematical analysis.) (*Oscillators, Germanium, Semiconductors, Surface properties.)

A series of experiments designed to measure the conditions under which one just observes the onset of oscillistor action are in progress. Experiments designed to show how these conditions depend upon the applied electric and magnetic field strengths and upon the sample geometry were completed. The procedure of sample preparation and the results of the experiments designed to show the dependence upon the applied electric and magnetic field strengths were discussed previously. These results and subsequent experiments regarding the effects of specimen geometry are presented. The effects of specimen length (i.e., the distance between the electrical contacts) and thickness were investigated for specimens in the shape of a rectangular solid with a square cross section. It was found that for an oscillistor in which the applied electric and magnetic fields are parallel, the dependence upon the length and thickness are quite complicated. At long lengths and small thicknesses, the experimental results are consistent with Glicksman's oscillistor theory, while at small lengths and/or large thicknesses there is a marked departure from Glickman's theoretical results. Between these 2 extremes there is a region of intermediate lengths and thicknesses where the dependence upon specimen geometry is not so severe and where the required electrical power input to the sample passes through a minimum. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-266 152 Div. 8
(TIPTE/CDM) OTS price $8.10

RCA Defense Electronic Products, New York.
INVESTIGATION OF TRAVELING WAVE PARAMETRIC AND HYBRID COUPLED TUNNEL DIODE AMPLIFIERS,
by D. Fleri and H. Boyet. July 61, 76p. incl. illus. tables (Rept. no. CR-61-419-20)
(Contract AF 30(602)2184, Proj. 4,505)
(RADC TR 61-231)
Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Parametric amplifiers, Broadband, Design.) (*Microwave amplifiers, *Diodes, Ultra high frequency, Very high frequency, Design.) (Amplifiers, Noise (Radio), Noise (Radar), Stability.)

The theory, design, construction, and performance of a tunnel diode hybrid coupled amplifier is presented with particular emphasis on gain, bandwidth, noise figure, and stability. The experimental unit developed exhibits maximum gain and minimum noise figure at approximately 100 mv and 140 mv bias respectively. At an operating bias of 120 mv the amplifier provides 8 db to 13 db gain over the 125 to 500 mcs frequency range. Measurements of 225 and 400 mc indicate the amplifier noise figure to be approximately 4.5 db. Amplifier stability formed an important aspect of this investigation. For stable operation it is necessary (and sufficient) that each amplifier module itself be stable when connected to the hybrid and that the loop gain between the input and output ports of the amplifier be less than unity. (Author)

AD-266 158 Div. 8, 14, 26, 17
(TIPTE/NTM) OTS price $2.60

Sperry Gyroscope Co., Great Neck, N. Y.
CERAMIC-METAL SEALS FOR HIGH-POWER TUBES.
Technical note no. 1, 10 Apr-9 July 61,
by S. S. Cole, Jr. and J. E. McLinden. July 61, 18p. illus. (Rept. no. NA-8250-8268-1)
(Contract AF 30(602)2371, Proj. 5573)
(RADC TN 61-217) Unclassified report

DESCRIPTORS: (Seals, *Metal seals, *Ceramic materials, *Electron tubes.) (Materials, Aluminum compounds, Ceramic materials, Oxides, Rupture, Tensile properties, Heat treatment, Bonding, Metals, Stresses, Reliability.)

The ceramic-to-metal seal technology study is a continuation study in which 200 metallizing compositions were examined. Ceramic specimens for tensile and modulus of rupture tests were ordered, and equipment for spray and roller-coat metallizing is being fabricated. The experimental sintering furnace and the Baldwin tester are being modified. A study of the variables which affect seal strength was planned. These variables include method of application; metallizing particle size, thickness, and compositions; sintering temperature, time, and rate; impurities; furnace dew point and atmosphere; and type of plate. The study of leak paths was initiated using a dye-impregnation technique. (Author)

AD-266 192 Div. 8
(TIPTE/CDM) OTS price $2.60

Tung-Sol Electric, Inc., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT IN UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION,
Quarterly rept. no. 7, 4 July-3 Oct 61,
by B. G. Firth, and Warren C. Johnson. 3 Oct 61, 21p. incl. illus. tables.
(Contract DA 36-039-sc-85120)
Unclassified report

DESCRIPTORS: (*Cold cathode tubes, *Oxide cathodes, Magnesium compounds, *Secondary emission, Tests.) (Electron tubes, *Cathodes (Electron tubes), Thin films, Coatings, Calcium compounds, Nitrates, Lithium compounds, Design.)

Data from 205 secondary emission analyzer tubes with MgO cold cathodes show that sufficiently high secondary to primary emission ratios (delta - 50-100) are required to sustain electron emission. This is not the only requirement. Adequate coating porosity and MgO surface area are also necessary. Thin film cathode coatings formed by evaporating Mg thru argon, neon, or helium with or without small additions of O2 did not sustain electron emission well enough to make any meaningful noise or electron velocity distribution measurements. Mg getters are superior to Ba getters for use in MgO cold cathode tubes. The use of Zr as a base metal was not practical for MgO cold cathodes. Noise depends on factors independent of other MgO cold cathode characteristics. (Author)

AD-266 203 Div. 8
(TIPTE/CDM) OTS price $3.60

Vitro Labs., West Orange, N. J.
GENERAL USAGE ASSEMBLIES FOR NAVY ELECTRONIC EQUIPMENT.
Final rept. Aug 59-June 61,
31 July 61, 25p. incl. table (Rept. no. VL-2062-7-0)
(Contract NObsr-72538)
Unclassified report

DESCRIPTORS: (*Electronic equipment, Naval equipment, Electronic circuits, *Electron tubes, Amplifiers, Oscillators, *Transistors, Distributed amplifiers, Generators, Life expectancy, Reliability, Tests, Climatic factors.)

Life testing of transistorized general usage assemblies has given invaluable data for the determination of assembly life, as well as validating reliability prediction techniques derived by these laboratories in a previous study program. Life testing of certain assembly types that underwent extensive environmental tests provided some insight into techniques for accelerated testing of electronic subassemblies. It was revealed that electronic assemblies can be expected to deliver adequate performance for an average period of 10 times longer under laboratory conditions than under normal in-use field conditions. Also, the life of an assembly can be expected to decrease by a factor of 64 (on the average) when that assembly has been exposed to standard, military-approved, environmental tests. A method of deriving meaningful accelerated tests for electronic assemblies is suggested by these observations. (Author)

AD-266 214 Div. 8
(TIPTE/CRJ) OTS price $9.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF AN L-BAND LOW-NOISE TRAVELING-WAVE AMPLIFIER. PART I.

Final engineering rept. on part 1, 1 Nov 59-15 June 61,
by B. P. Israelsen. 15 June 61, 112p. incl. illus. tables.
(Contract AF 30(602)2100, Proj. 5535)
(RADC TR 61-178, pt. 1)
Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Microwave amplifiers, Helixes, L band, S band, Design.) (Electron tubes, Noise (Radio), Phase shifters.) (Amplifiers, Electron beams, Electron guns, Coupling circuits, Radiofrequency filters.)

The design and operating characteristics are presented of the WJ-212 low noise TWT operating over the frequency band 1.1 to 1.5 kmc. Terminal noise figure over this band is under 3.4 db, with spot noise figures as low as 2.6 db having been recorded. The tube is operable over an extended bandwidth, from 1.0 to 2.0 kmc. Under these conditions it has a noise figure of about 3.5 to 4.5 db. Gain is in excess of 20 db in all cases. Detailed data covering various operating characteristics are presented. Items treated are noise figure, gain, and phase shift, and the manner in which each is affected by changes in operating voltages and currents. Also presented is the development of a beam-type variable-parameter amplifier having a 1000 mc bandwidth, centered at 3000 mc. Only cyclotron-wave interaction was considered, due to the previously demonstrated difficulties of obtaining low-noise amplification by parametric pumping of space-charge waves. Two different types of interaction were investigated. The first involves a periodic spatial interchange of energy between beam and circuit. The second type of interaction depends on an exponential spatial energy transfer, and does not require critical parameter adjustment. (Author)

AD-266 246 Div. 8, 14, 26
(TIPTE/NTM) OTS price $2.60

Knights, James, Co., Sandwich, Ill.
GLASS HOLDER CRYSTAL UNITS.
Quarterly progress rept. nos. 5 and 6, Aug 60-July 61,
by C. W. Snyder. July 61, 25p. incl. illus.
(Contract DA 36-039-sc-81274)
Unclassified report

DESCRIPTORS: (*Glass seals, *Crystal holders, *Quartz crystals, Vacuum seals, Design, *Manufacturing methods.) (Seals, Industrial equipment, Industrial production.) Production.

Research was concerned with: a check-out of the production type glass-sealing machine; the determination of the effect on frequency and resistance of the crystal resulting from the glass-sealing operation; and attempts to produce a crystal design at 800 kc which when mounted in the HC-6/U glass holder would meet the performance specifications. Small batch runs of HC-6/U glass parts on the production sealing machine produced yields of approximately 75% free of cracks or excessive strains. It was determined that line voltage changes detuned the system sufficiently to interfere with the heat programming. The temperatures reached in sealing to provide seals sufficiently free of strains were found to be marginally high for silver plated 9 and 20 mc crystals but not too high if gold electrodes were used. (Author)

AD-266 255 Div. 8, 25, 30
(TIPTP/WH) OTS price $5.60

Aeronutronic, Newport Beach, Calif.
INVESTIGATION AND FUNDAMENTAL STUDY OF CRYOSAR OPERATION AND APPLICATION.
Quarterly scientific rept. no. 1, 1 July-30 Sep 61,
by L. Lambert, Jr. 30 Sep 61, 50p. incl. illus. tables, 36 refs. (Publication no. U-1413)
(Contract AF 19(604)8458)
(AFCRL-928)
Unclassified report

DESCRIPTORS: (*Semiconductors, Solid state physics, Germanium, Electrical properties.) (Single crystals, *Germanium, Impurities, *Cryogenics, Helium, Liquefied gases.) (*Digital systems, Semiconductors, Cryogenics.)

Preliminary results of a study being conducted toward understanding the nature of the negative resistance phenomena in compensated germanium experiencing impact ionization at 4.2 degrees Kelvin are presented. The first part of the study is the theoretical formulation of an acceptable model and the solution of pertinent equations which would predict the device's operation with regard to its constituent impurities. The second part is concerned with the growing of doubled doped germanium single crystals and measuring the electrical properties at liquid helium temperature. Particular care must be exercised in establishing a growing technique which permits accurate inclusion of desired impurities uniformly into the germanium crystal structure. (Author)

AD-266 313 Div. 8, 26
(TIPTE/CDM) OTS price $1.60

Radio Corp. of America, Somerville, N. J.
70mc, 1 WATT SILICON TRANSISTOR.
Quarterly rept. no. 9, 5 June-5 Sep 61,
by F. L. Katnack, ed. by H. J. Carter. 5 Sep 61, 9p. incl. tables.
(Contract DA 36-039-sc-81285)
Unclassified report

DESCRIPTORS: (*Transistors, Silicon, Very high frequency, *Manufacturing methods, Production.) (Containers, Gold plating, Tests, Climatic factors, Storage.) (*Corrosion inhibition, Finishes.)

An evaluation was made of 6 different case finishes after exposure to 200 C storage and salt atmosphere corrosion resistance tests. Results indicated gold plating to be the most satisfactory. The gold is solderable, does not discolor or peel on 200 C storage, and has a fair resistance to salt atmosphere. The greatest difficulty observed with the gold finish has been lead corrosion at the glass-to-metal seal during salt atmosphere testing. Diffusion and metallizing processes were slightly modified to improve the BV/CES yields. However, degradation of collector breakdown voltage during assembly is still a production problem. (Author)

AD-266 324 Div. 8, 26
(TIPTE/CRJ) OTS price $10.10

Sylvania Electric Products, Inc., Emporium, Pa.
CERAMIC STACKED TUBE TYPE SN-2146C.

Final technical engineering rept. 2 Sep 58-9 Apr 61, on Ceramic Stacked Pentode, by S. L. Pawlikowski. Sep 61, 125p. incl. illus. tables.
(Contract AF 33(600)37967; Continuation of Contract AF 33(038)9853)
(ASD TR 61-7-115) Unclassified report

DESCRIPTORS: (*Electron tubes, Ceramic materials, Design, *Manufacturing methods, Production, Materials, Tests, Shock resistance, Vibration, Life expectancy, Specifications.)

A pilot line activity was continued on Type SN-2146C, a ceramic stacked tube, to improve the design, materials, manufacturing techniques and to evaluate the tube type under various environmental conditions. Tooling design changes necessary for attainment of maximum power output at minimum distortion were effected, the associated bell-jar exhaust equipment necessary for tube manufacture was installed, and life test ovens with temperature range capabilities of 300 to 800 C were installed and evaluated. Parts processing and manufacturing techniques were evaluated and improved. Sealing techniques which insure a high degree of reliability were evolved. Methods of increasing production potential were satisfactorily developed and used. One hundred good tubes of the final design were produced. An intensive tube evaluation program was carried out. This included tube testing under severe environmental conditions of shock, fatigue, vibration and evaluation of life test performance at elevated temperatures, as well as static and dynamic electrical tests. These data were analyzed and a final testing specification was evolved. (Author)

AD-266 392 Div. 8, 5
(TIPTP/WH) OTS price $2.60

RCA Service Co., Inc., Patrick Air Force Base, Fla.
PROPAGATION OF STRONG ELECTROMAGNETIC WAVES IN WEAKLY IONIZED ROCKET EXHAUSTS,
by Raul R. Hunziker. 1 Sep 61, 29p. incl. illus.
(RCA Systems Analysis technical rept. no. 18)
(Subcontract to Pan American World Airways, Inc., New York, Contract AF 08(606)3413)
(AFMTC TR 61-19)
Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Propagation, Exhaust gases, *Attenuation.) (*Radio transmission, Radio waves, Attenuation, Reduction.) (Gases, Ions, Conductivity.)

New calculations are performed to ascertain more fully the proposal of transmitting powerful sacrificial waves from a rocket through the exhaust and thus diminish the attenuation of weaker signals used for communication. Numerical solution of a nonlinear boundary value problem allows the presentation of results in non-dimensional form and a comparison with earlier calculations. (Author)

AD-266 428 Div. 8, 25
(TIPTE/CDM) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
NEAR-FIELD CHARACTERISTICS OF ARRAY ANTENNAS,
by Leon J. Ricardi, W. C. Danforth, Jr., and Mary H. Malone. 17 Oct 61, 5p. illus. (Rept. no. 315G-1)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Dipole antennas, *Antenna radiation patterns, Tests, Mathematical analysis.) (Antennas, Radiation effects, Hazards.)

The near-field characteristics of a radiating aperture have become increasingly more interesting as the state of the art has produced large apertures radiating unusually large amounts of average power. Of particular interest is the possibility of producing a radiation hazard either intentionally or unintentionally. In order to determine a better picture of the phenomena, the radiation-pattern characteristics of a line source consisting of 101 dipoles spaced one-half wavelength apart were calculated. In general these data show the following: (1) it is possible to focus the radiated energy with the same angular resolution to any point directly in front of the line source and at least 2 times its length (2D) from it; (2) over this range of distances in front of the line source, the maximum power density varies in accordance with the R-squared law; and (3) the angular resolution deteriorates as the array is focused to points less than 2D from the line source. (Author)

AD-266 455 Div. 8, 25
(TIPTW/RD) OTS price $1.10

Ballistic Research Labs., Aberdeen Proving Ground, Md.
RELATIONSHIP BETWEEN ADDITIVE AND NON-ADDITIVE QUANTUM FLUCTUATIONS,
by L. P. Bolgiano, Jr. Sep 61, 8p. (BRL Technical note no. 1424)
(DA proj. no. 503-05-023)
Unclassified report

DESCRIPTORS: (Radio signals, Measurements, Quantum mechanics, *Signal-to-noise ratio, *Noise (Radio), Infrared radiation.) (*Electromagnetic fields, Quantum mechanics.) (Thermal radiation, Blackbody radiation, Signal-to-noise ratio, Quantum mechanics.) Masers.

The limitation imposed by quantum mechanics on the measurement of electromagnetic signals may be viewed as a non-classical noise. Theory leads both to a minimum noise, which is additive in the sense of being independent of signal strength, and to a non-additive noise dependent on signal strength. The relationship between these two types is discussed. Also a short derivation is given which exhibits their common relationship to the zero-point fluctuation attributed by quantum theory to the electromagnetic field. (Author)

AD-266 502 Div. 8, 26
(TIPTW/DLW) OTS price $2.60

General Electric Co., Owensboro, Ky.
DEVELOPMENT OF AN IMPROVED JAN 6299.
Quarterly progress rept. no. 1, 1 May-31 July 61, 31 July 61, 21p.
(Contract DA 36-039-sc-85953)
Unclassified report

DESCRIPTORS: (*Electron tubes, Cathodes (Electron tubes), Ceramic materials, Seals, Silver solders, Aluminum compounds, Temperature, Coatings, Humidity, Reliability, Test methods, Processing, *Manufacturing methods, Production.)

Investigations are being made to obtain better performance and greater reliability from the JAN 6299 by evaluating and adapting the latest tube technological advancement. Seven projects are outlined which are designed to improve some specific part of the tube. Progress made on each of the projects is listed. Some expected problems are discussed with the steps planned for their solution. (Author)

AD-266 505 Div. 8, 26
(TIPTW/DLW) OTS price $8.60

General Electric Co., Syracuse, N. Y.
SOLID STATE FILTERS, DELAY LINES AND TRANSFORMERS,
Quarterly rept. no. 9, 1 July-1 Oct 61,
by L. E. Nikus, C. M. Stearns, and S. W. Tehon.
1 Oct 61, 49p. incl. illus.
(Contract DA 36-039-sc-85049, Proj. 36-26-07-001-03)
Unclassified report

DESCRIPTORS: (*Radiofrequency filters, *Power transformers, Transformers, Low frequency, Very low frequency, *Delay lines, Solid state physics, *Miniature electronic equipment, Ceramic materials, Ferroelectric materials, Piezoelectric materials, Radiofrequency oscillators, Cavity resonators, Oscillator circuits, Electronic circuits, Magnetostrictive elements, Design, Packaging, Tests.) (Electronic equipment, Processing, Manufacturing methods, Test methods.)

Composite filters with NI-SPAN C as the center material were built and evaluated. Temperature-frequency measurements made on the NI SPAN C before and after the material was fabricated into filters demonstrate that composite filters with near zero frequency-temperature coefficient over a 100 C range can be constructed by careful heat treatment of the NI-SPAN C. Examples of multiple element ceramic transformer filters are presented. Cascade filters are much more selective than single element filters and can be designed with shape factors in the order of 1.2 to 2 with three to eight ceramic elements. Mounting investigations of flexural mode filters were continued and preliminary results indicate that magnetostrictive reeds can be mounted on pins at the ends of the nodal lines without adverse effects. (Author)

AD-266 511 Div. 8
(TIPTE/CCD) OTS price $11.50

Electronics Research Labs., Columbia U., New York.
THE CASCADE PHASE SHIFT MODULATOR EMPLOYING NEGATIVE FEEDBACK,
by A. Boutross, L. Baum, and H. Stein. 1 July 61, 150p. incl. illus. tables (Technical rept. no. T-4/164; CU-5-61-AF-2233-ERL)
(Contract AF 30(602)2233)
(RADC TN 61-187) Unclassified report

DESCRIPTORS: (*Phase shifters, *Phase modulation, Frequency modulation, *Modulators, *Generators, Electronic equipment, Feedback, Electrical networks, Design, Discriminators, Signal-to-noise ratio.)

A novel low noise FM ramp generator to be used as a component of an FM system is described. The FM ramp is generated by means of a cascade phase shift modulator in a negative feedback loop which is followed by a frequency multiplier to provide the required output frequency deviation of 400 kc in 2 ms. The maximum permissible distortion of the FM output ramp measured as a departure from an ideally linear ramp is one per cent of the total ramp deviation. In analyzing the system behavior, special attention was given to those problem areas associated with linearity and noise. Measurements demonstrated that the generator meets the linearity requirements of the over-all FM system. The noise performance is more difficult to project. It appears that except in a limited band, some 10 to 20 kc on either side of the carrier, the noise requirements will be fully met. In this band the noise may exceed the specification for the FM system, but by no more than 6 db. A description of each component circuit, together with schematic diagrams and a step-by-step operating procedure, are included. (Author)

AD-266 516 Div. 8, 25
(TIPTP/MFA) OTS price $5.60

Geophysical Inst., U. of Alaska, College.
EXPERIMENT LUXEMBOURG.
Final rept.
by W. L. Flock and R. F. Benson. Aug 61, 34p. illus. tables (Rept. no. UAG-R121)
(Contract AF 19(604)3880)
(AFCRL-846) Unclassified report

DESCRIPTORS: (*Radio waves, Modulation, *Ionosphere, Scattering, Signals, Noise, Electrons, Density, *Radio interference, Attenuation, Oscillation.) (Experimental data, Analysis.) Instrumentation.

The radio-wave interaction technique was applied to the study of the lower ionosphere at College, Alaska. The system employs a pulsed wanted transmitter operating at a frequency of 4.86 Mc/s and a pulsed disturbing transmitter operating at 17.5 Mc/s with an output power of 100 kw. Radio-wave interaction has been recorded over the elevation range from 30 to 70 km. The system is best adapted to observations under somewhat disturbed ionospheric conditions. The observed interaction normally shows significant variation within time intervals of the order of minutes. Some collision frequency and electron density values were derived. (Author)

AD-266 528 Div. 8
(TIPTE/NTM) OTS price $3.60

Hughes Aircraft Co., Culver City, Calif.
THE NEGATIVE CONDUCTANCE SLOT AMPLIFIER,
by M. E. Pedinoff. 24 May 61, 32p. incl. illus. 17 refs. (Scientific rept. no. 3)
(Contract AF 19(604)8386)
(AFCRL-920) Unclassified report

DESCRIPTORS: (*Microwave amplifiers, *Antenna amplifiers, *Slot antennas, Microwaves, Waveguide slots, Solid state physics, Design.) (Noise, Impedance, Inductance, Oscillation, High frequency, Stability, Diodes, Semiconductors, Electronic circuits.) (*Amplifiers, Electron tubes.)

It was suggested that the incorporation of active solid state devices into the elements of an antenna may lead to the simplification of the overall microwave system and at the same time to a reduction in size, power and weight requirements. Several approaches to a study of the microwave properties of a slotted antenna element shunted by a tunnel diode biased into its negative conductance region are discussed. The first approach involves calculation of the lumped parameter equivalent circuit of the slot amplifier system at resonance and can be extended to determination of the gain bandwidth and noise performance of the device, whereas the second approach is concerned with the admittance of the slot and

the diode as a function of frequency over a wide frequency range. The latter method of analysis successfully predicts the conditions of oscillation and amplification at fundamental as well as higher frequency resonances and leads to a method for stabilization of the system. Preliminary experimental results indicate a transmission gain of 21 db at 2.7 kmc with a Hughes Number PC-3 GaAs tunnel diode in the slot amplifier. A different diode of the same type resulted in an amplifier with a 3 db bandwidth of 21 mc and a gain of 16 db at a center frequency of 2.7 kmc. (Author)

AD-266 534 Div. 8, 25
(TIPTP/WH) OTS price $2.75

Electronics Research Lab., U. of Calif., Berkeley.
FAST WAVES IN PLASMA-FILLED WAVEGUIDES,
by V. Bevc and T. E. Everhart. 11 July 61, 127p. incl. illus. tables (Series no. 60, Issue no. 362)
(Contract AF 33(616)6139, Proj. 4150)
(ASD TR 61-14) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Velocity, *Propagation, *Waveguides, Plasma physics.) (Waveguides, Wave transmission, Cyclotrons.)

In the analysis of the waves that propagate in a waveguide completely or partially filled with a stationary plasma column or an electron beam drifting with a uniform velocity and collimated with a magnetic field of finite magnitude it is necessary to include the effects of the rotation of the electric field in order to treat the waves which have phase velocities comparable to or greater than the velocity of light. A general dynamic method is developed which is appropriate for the treatment of cases that cannot be solved with quasi-static calculations and which contains all the special cases that have been heretofore treated separately. A classification of modes of propagation is proposed and formulas for cutoff frequencies as functions of the cyclotron frequency as well as some representative Brillouin diagrams are given for both completely and partially filled waveguide. Equations for neutralized electron beam are obtained when the Lorentz transformation is applied to the equations for stationary plasma. The solutions for stationary plasma can be transformed directly into the solutions for neutralized electron beam. (Author)

AD-266 535 Div. 8, 6
(TIPTE/CDM) OTS price $2.60

HRB-Singer, Inc., State College, Pa.
DATA ANALYSIS AND LONG RANGE INTERCEPT TECHNIQUES.
Quarterly progress rept. no. 2, 1 June-30 Sep 61, by E. H. Wintermute. 30 Sep 61, 22p. incl. illus. (Rept. no. 290-2)
(Contract DA 36-039-sc-87272)
Unclassified report

DESCRIPTORS: (*Radio interception, *Radar interception.) (*Phase shifters, *Band-pass amplifiers, *Parametric amplifiers, Broadband, Design.) (*Microwave amplifiers, Very high frequency, Ultra high frequency.) (Noise (Radio), Impedance, Measurement.)

The results of investigation of availability of broad band gain throughout the 50-1100 mc band using phase shift amplifiers are reported. Approximately 10 db of gain was obtained from 150-300 mc, from 250 to 500 mc, and about 6 db from 700 to 1100 mc. Some minor modifications of the varactor mount were necessary to obtain the desired gain from 700 to 1100 mc. (Author)

AD-266 538 Div. 8, 26
(TIPTE/NTM) OTS price $2.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, VARIABLE (FILM TYPE).
Quarterly progress rept. no. 13, 1 June-31 Aug 61,
by John Woods. 31 Aug 61, 23p. tables.
(Contract DA 36-039-sc-75981)
Unclassified report

DESCRIPTORS: (*Variable resistors, Resistors, Films, Production, *Manufacturing methods, Design.) (Carbon alloys, Gold alloys, Silver alloys, Films, Carbon resistors.) (Moisture-proofing, Coatings, Sealing compounds.)

Research was continued on the development of resistors. Performance tests of pre-pre-production potentiometers are in progress. Deviations from the specification were found primarily in moisture resistance and temperature coefficient. Steps were taken to improve moisture resistance through better sealing of the housing and protection of the termination. Temperature coefficient is high for high resistance values, and is characteristic of the carbon alloy film. (Author)

AD-266 571 Div. 8
(TIPTE/NTM) OTS price $2.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
RESEARCH AND DEVELOPMENT ON HIGH-POWER CRESTATRONS FOR THE 100-300 MC FREQUENCY RANGE.
Quarterly progress rept. no. 5, 1 July-1 Oct 61, by G. T. Konrad and C. Yeh. Oct 61, 15p. incl. illus. (Rept. no. 03783-6-P)
(Contract NObsr-81403, Proj. SF-0100201)
Unclassified report

DESCRIPTORS: (*Radiofrequency amplifiers, Amplifiers, Electron tubes, Very high frequency, Theory, Design.) (*Electron guns, Electrostatics, Focusing, Electron beams, Electron lenses, Thermocouples, Interception, Tests.) (Helixes, Coupling circuits, Design.)

The emphasis of the program was shifted to the construction of a good gun of microperveance 4.46. Good beam control by the Einzel lens and low beam interception are desired goals. Work on higher perveance guns is reported. Experiments in connection with coupled-helix couplers are presented. (Author)

AD-266 583 Div. 8
(TIPTE/CRJ) OTS price $4.60

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
MASERS: A STATE-OF-THE ART SURVEY,
by Ralph J. Polley. 21 Aug 61, 38p. incl. illus. (USL rept. no. 520)
(Proj. no. S-R011-01 01-0401)
Unclassified report

DESCRIPTORS: (*Masers, *Microwave amplifiers, Cavity resonators, Paramagnetic resonance, Theory, *Bibliography, Design.) (Materials, Ruby, Ammonia, Crystals, Helium, Neon, Gases.) (Noise (Radio), Measurement, Analysis.)

A survey of maser(microwave amplification by stimulated emission of radiation)theory and technology is presented, to provide a basis whereby future maser potentialities may be determined. The study includes a brief historical sketch and an introduction to the theoretical concepts involved, a treatment of the various types of masers, their associated techniques and characteristics, a consideration of maser materials, operating parameters, and design limitations. It concludes with a discussion of present and future applications, particularly those relating to the program at USNUSL. An extensive bibliography is included. (Author)

AD-266 593 Div. 8, 25
(TIPTP/JW) OTS price $6.60

Northwestern U., Evanston, Ill.
MICROWAVE MEASUREMENTS OF MAGNETO-GAS DYNAMIC PLASMAS,
by R. C. Warder, Jr., M. Brodwin, and Ali Bulent Cambel. Aug 61, 60p. incl illus.
(Contract AF 49(638)879)
(AFOSR-1468) Unclassified report

DESCRIPTORS: (*Microwave probes, Plasma physics, Measurement.) (Wave transmission, Microwave relay systems, Interferometers.) (X bands, Microwave equipment.) (*Magnetohydrodynamics, *Gases, Gas flow, Electric arcs, Dielectric properties, Electric properties, Resistance.)

The use of microwave probes as a diagnostic tool to determine the electrical conductivity and the dielectric constant of a plasma were adapted to the arc jet facility in the Gas Dynamics Laboratory. In particular an X-band microwave interferometer and a reflection, and transmission type experiment were designed and utilized. The microwave techniques were investigated using models. The studies described in this analysis show that the infinite slab hypothesis is invalid for the given plasma slab size using X-band microwaves. (Author)

AD-266 595 Div. 8
(TIPTW/DLW) OTS price $2.60

Naval Research Lab., Washington, D. C.
A HIGHLY ACCURATE SQUARE-LAW RECORDER.
Final rept.,
by J. A. Alexander, Jr. 17 Aug 61, 20p. incl. illus. (NRL Rept. no. 5612)
(Proj. no. RF 001-02-41-4004)
Unclassified report

DESCRIPTORS: (*Hydrographic surveying, Ocean waves, Statistical analysis, Water waves, Surface area, Surface properties, Recording systems, *Recording devices, Design.) (Frequency analyzers, Magnetic recording systems, Diodes, Electronic circuits, Design.) (*Alternating current, *Frequency analyzers, Design.)

The square-law recorder is an instrument designed to take signals from zero to one volt rms in a narrow frequency band centered at 50 kc as in input and record in strip-chart form the square of this input times some fixed constant. The squaring process is performed by keeping the power to the filament of a temperature-limited thermionic diode constant by reducing the direct current to the filament as an ac signal is applied. Since the maximum power supplied by the ac signal is only a small fraction of the total filament power, the decrease in direct current is proportional to the square of the alternating current. The system has negligible zero drift, and the power scale is inherently linear without the use of large correction factors. The accuracy of the chart readings is better than 1% for values above 10% full-scale deflection, and the zero drift is less than 1/2% full scale over a 6 hour period. (Author)

AD-266 597 Div. 8, 30
(TIPTP/JW) OTS price $1.60

Naval Research Lab., Washington, D. C.
ELECTRON BEAM INTERACTION IN CUCCIA COUPLER AND ITS EFFECT ON QUADRUPOLE AMPLIFIER PERFORMANCE.
Final rept.,
by H. D. Arnett. 23 Oct 61, 13p. incl. illus.
(NRL rept. no. 5695)
(Proj. nos. RR-008-03-46-5650 and RS-008-03-02)
Unclassified report

DESCRIPTORS: (Waveguide couplers, *Electron beams, Velocity, Resonance.) (Wave transmission, Wave analysis, Cyclotrons.) (Amplifiers, Wave characteristics, Microwave amplifiers, *Parametric amplifiers.)

A theoretical treatment was developed on the interaction of a filamentary electron beam with the fields of a Cuccia coupler. This treatment shows that within the region occupied by the coupler there is an electron disturbance that propagates with infinite phase velocity (synchronous with the circuit velocity) as well as the fast cyclotron wave, slow cyclotron wave, and synchronous wave (synchronous with the beam velocity). The electronic admittance of the coupler was computed and plotted in terms of normalized variables as a function of frequency, with coupler length as a parameter. For a long coupler, it is found that the electronic admittance corresponds to that of a resonant circuit, resonant at the cyclotron frequency and having a Q that is directly proportional to the coupler length and inversely proportional to the cyclotron wavelength. The constant of proportionality is pi/3. Some properties of slow-wave couplers were also investigated. (Author)

AD-266 603 Div. 8, 7
(TIPTP/JW) OTS price $2.60

Naval Research Lab., Washington, D. C.
ELECTRICAL BREAKDOWN IN VACUUM.
Interim rept.,
by R. P. Little, S. T. Smith, and H. D. Arnett.
2 Oct 61, 19p. incl. illus. tables (NRL rept. no. 5671)
(Proj. no. RF 009-01-41-6064)
Unclassified report

DESCRIPTORS: (Vacuum systems, *Electrodes, *Electrical discharges, Voltage.) (Electron beams, Anodes (Electronic tubes), Cathodes (Electronic tubes), Contamination.)

The voltage breakdown in vacuum was studied at gap spacings of 0.015 inch. Measurements indicate little or no variation of breakdown with

tube pressure between approximately 10 to the -5th and 10 to the -7th power torr and with frequency of the applied voltage from 0 to 6 Mc. Electrical breakdown in vacuum is prefaced by prebreakdown currents caused by electron emission from small isolated areas on the cathode electrode. As a result of this emission, individual, small-diameter electron beams are formed between cathode and anode. These beams can cause the anode and cathode power dissipation density to become extremely high, resulting in evaporation, melting, and destructive effects. The observed prebreakdown emission is believed to result from contaminants modifying the image barrier of the cathode and not from local field enhancements due to irregularities of the cathode surface. (Author)

AD-266 609 Div. 8, 7
(TIPTA/VGW) OTS price $14.50

Melpar, Inc., Falls Church, Va.
STANDARD MODULES FOR AVIONICS EQUIPMENT.
Final rept.,
by J. H. Namaroff. 21 Sep 61, 214p. incl. illus. tables, 19 refs.
(Contracts N62269-981, N62269-989, and N62269-991)
(Rept. no. NADC-EL-6181)
Unclassified report

DESCRIPTORS: (*Electronic circuits, *Electronic equipment, *Printed circuits, Packaged circuits, *Packaging, Standardization, Design, Tests.) (Generators, Viedo amplifiers, Power supplies, Voltage regulators, Shock resistance, Vibration, Heat transfer, Cooling, Reliability, Life expectancy, Measurement.) (Test equipment, Design.) (Transistors, Electron tubes.)

A consolidated report has been prepared to provide supporting data for the development and standardization of modules and cooling test fixtures, fabrication of modules, and the design and development of transistor modules in the form of expendable and repairable packages. (Author)

AD-266 650 Div. 8
(TIPTE/CDM) OTS price $9.60

Radioplane Div., Northrop Corp., Van Nuys, Calif.
RESEARCH STUDIES ON VERY LOW FREQUENCY ANTENNA TECHNIQUES.
Engineering rept. no. 1, June-Oct 61.
6 Oct 61, 99p. illus. (Rept. no. 2465-1)
(Contract AF 30(602)2497, Proj. 5583)
(RADC TN 61-225). Unclassified report

DESCRIPTORS: (*Antennas, Very high frequency, *Antenna radiation patterns, Measurement, Ultra high frequency, Tests.) (Impedance matching, Impedance, Measurement.) Communication equipment.

A study was made of the parameters of the antenna boundary which optimize the efficiency of a reduced height VLF antenna and, at the same time, control the distribution of radiated energy into space so as to secure maximum communications gain in terms of the characteristics known to obtain for the propagation environment. At this point in the study, the development of the basic radiator element is of primary concern. Activity is reported in both analytical and measurement areas. (Author)

AD-266 660 Div. 8, 25
(TIPTP/WH) OTS price $2.60

Microwave Lab., Stanford U., Calif.
GENERAL STUDIES IN HIGH-POWER MICROWAVE CONCEPTS.
Scientific rept. no. 34, 1 Apr-31 June 61.
Sep 61, 23p. incl. illus. (ML rept. no. 845)
(Contract AF 19(604)1930)
(AFCRL-915) Unclassified report

DESCRIPTORS: (*Microwave equipment, Electron tubes, *Parametric amplifiers, Microwave amplifiers, Amplifiers.) (*Electron beams, Electron guns, Electrostatics.) (Plasma physics, Electromagnetic waves, Propagation, Theory, Cesium, Scattering.) (Impedance, Microwaves, Plasma oscillations.)

Contents:
Microwave tube studies
Investigation of the behavior of velocity-modulated electron beams in long gaps
Crossed-field electron guns
Electrostatic-beam type parametric amplifier
Plasma physics studies
Electron-beam interaction with a plasma
Plasma parametric amplifier
High-frequency diagnostic technique for plasmas
Thermal plasmas
Nonlinear plasma theory
Noise in plasmas
Plasma diagnostic techniques
Electron-beam interaction with a cesium plasma
Harmonic generation in plasmas
Studies of plasma oscillations

AD-266 668 Div. 8
(TIPTE/CDM) OTS price $6.60

Electronic Defense Labs., Mountain View, Calif.
DESIGN OF SINGLE DIODE WIDEBAND PARAMETRIC AMPLIFIERS OF SPECIFIED GAIN, BANDWIDTH, AND SIGNAL LOAD IMPEDANCE,
by Alex Mayer. 15 Sep 61, 63p. incl. illus.
(Technical memo. no. EDL-M353)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (*Parametric amplifiers, Broadband, Design, Mathematical analysis, Synthesis, Equations.) (*Microwave amplifiers, Amplifiers, *Diodes, Bondpass filters, Electronic circuits, Impedance.)

Design procedure is described for fixed-frequency wideband parametric amplifiers which utilize a single varactor diode and operate in the three-frequency mode: f sub p=f+f'. The procedure is applicable to designing with lumped and/or distributed circuit elements. The circuit is one analyzed by Matthaei and is achieved by the synthesis of appropriate signal and idler bandpass filters from a low-pass prototype. The design procedure is for specified but arbitrary signal, midband gain C sub SO, (Fractional) bandwidth w sub D, and signal filter midband impedance R sub bo. One result of developing design equations for arbitrary R sub bo is that the transformer between R sub bo and R sub c is now eliminated by simply assigning R sub bo equals R sub c. Numerical examples of designs are given for degenerate and non-degenerate microwave amplifiers. (Author)

AD-266 669 Div. 8, 5
(TIPTE/NTM) OTS price $11.00

Sylvania Electric Products, Inc., Waltham, Mass.
MICROMINIATURIZATION TECHNIQUES FOR COMMUNICATION EQUIPMENT.

Rept. on Applied Communication Research for Air Force Vehicles,
by George Anderson. Sep 61, 147p. incl. illus. tables (Rept. no. F440-3)
(Contract AF 33(616)6309, Proj. 4335)
(ASD TR 61-453) Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment, Reliability, *Radio receivers, Design, *Communication equipment, Radio communication systems, Ultra high frequency.) (Transistors, Ceramic capacitors, Tantalum capacitors, Diodes, Coils, Resistors, Capacitors, Semiconductors.) (*Electronic circuits, Printed circuits, Video amplifiers, Power amplifiers.) (Materials, Dielectrics, Ceramic materials, Thin films.)

Aerospace electronic equipment must be capable of high performance reliability coupled with small size and low weight. To investigate and apply techniques of microminiaturization to circuits designed for high reliability performance, a two-phase study was initiated: (1) to develop ultra-reliability design techniques in communication equipment, and (2) to microminiaturize the resulting circuits. A summary is presented of data gathered and experience gained while microminiaturizing major portions of an ultra-reliable UHF communications receiver. Information and instructions were compiled to guide transistor circuit engineers in designing semiconductor circuits that lend themselves to microminiaturization. Examples are cited and design approaches are delineated. As a demonstration of microminiaturization capabilities, a wide band video amplifier, receiver redundant 60-mc IF circuits, automatic gain control circuits, and UHF power amplifier and double circuits were built, tested and delivered. (Author)

AD-266 697 Div. 8
(TIPTW/DLW) OTS price $4.60

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
IRIG STANDARD COORDINATE SYSTEM AND DATA FORMAT FOR ANTENNA PATTERNS.
Sep 61, 43p. incl. illus. table, 20 refs. (IRIG Document no. 102-61)
Unclassified report

DESCRIPTORS: (*Guided missile antennas, *Satellite vehicle antennas, *Antenna radiation patterns, Measurement, Standards.) (Guided missiles, Surface to surface, Satellite vehicles, Test facilities, *Antennas, Antenna radiation patterns, Measurement, Standards.) Polarization.

The inadequate exchange of technical information among the many groups which normally participate in most complex scientific programs is a difficult communications problem. One area, for example, where the proper exchange of data is vital, concerns information on radiofrequency radiation characteristics of vehicle-borne as well as ground antennas. In this particular area, the establishment of a common language and a standard is necessary. Accordingly, definitions are presented for (1) a vehicle-antenna coordinate system, and (2) antenna pattern formats recommended for use at the National and Service Ranges. Antenna polarization considerations, a sample analysis of a contour antenna pattern and a number of definitions associated with vehicle antenna pattern representation are also presented. (Author)

AD-266 712 Div. 8, 26
(TIPTE/NTM) OTS price $2.60

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURES HIGH FREQUENCY TRANSISTOR.
Quarterly progress rept. no. 1, 20 June-20 Sep 61,
by T. G. Stoudt. 20 Sep 61, 24p. incl. illus.
(Contract DA 36-039-sc-85969)
Unclassified report

DESCRIPTORS: (*Transistors, Germanium, Production, Design, Tests, High frequency, *Manufacturing methods.) (Germanium compounds, Oxides, Preparation, Processing.)

Efforts are being made to provide engineering necessary to establish production design of a 1000 mc. germanium transistor, to manufacture engineering test samples of the device, to develop and provide limited production equipment for the processes established for a pilot line, and to produce pilot run samples on machinery. Present effort was concentrated in: (1) development of a process to evaporate and alloy the proper configuration on the wafer mesa surface, (2) development of mechanical assembly processes, and (3) analysis for preliminary electrical evaluation of the devices. (Author)

AD-266 736 Div. 8
(TIPTE/CDM) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
PULSE GROUP MODULATORS FOR THE 100-kv RANGE,
by Richard D. Bauman. 11 Sep 61, 40p. incl. illus. tables, 11 refs. (Rept. no. EDL-M371)
(Contracts DA 36-039-sc-85402 and DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (*Pulse generators, *Pulse modulation, Microwave equipment, Design.) (*Modulators, *Electron tubes, *Electronic circuits, Electronic switches, *Switching circuits.) Countermeasures.

Due to possible requirements for pulse-group modulation at voltages in the 100-kv range, a study was made to evaluate old methods and develop new techniques for producing such modulation. The study considered 4 possible approaches, and the Marx circuit is recommended as the best solution, at present, to any quick-reaction requirement. (Author)

AD-266 774 Div. 8
(TIPTP/MFA) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
NEW THEORIES OF RADIO-WAVE PROPAGATION.
27 Oct 61, 6p. incl. illus. (Trans. no. MCL-1366 of Przeglad Techniczny 43:p. 6, 26 Oct 60)
Unclassified report

DESCRIPTORS: (Translations, USSR.) (Radio waves, Wave transmission, *Ionosphere.) (Plasma physics, Electromagnetic waves, Electrons, Ionization.) (*Exosphere, Radar echo areas, Terrestrial magnetism, Antarctic regions.)

Scientific investigations of radio wave propagation are presented which lead to a new view of a number of radio problems. The following statements are discussed: Fast electrons amplify radio waves in the ionosphere; the ionosphere is not flat but wavy; in the ionosphere the field intensity of radio waves is amplified; radio echoes in the ionosphere and exosphere.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-266 784 Div. 8
(TIPTE/NTM) OTS price $1.60

Electronic Defense Labs., Mountain View, Calif.
DESIGN CRITERIA FOR LOG PERIODIC ANTENNAS,
by Claes T. Elfving. 12 July 61, 14p. incl. illus. (Technical memo. no. EDL-M331)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: (*Antenna radiation patterns, *Dipole antennas, Measurement, Design.) Antennas.

Measurements taken on a log periodic antenna are described and the relationships found between the physical parameters and the electrical performance of the antenna are pointed out. This information was combined into a design nomograph. A special variable-parameter log periodic antenna was constructed such that the basic design parameters could be varied over a wide range. Measurements for many different values of these parameters revealed, among other things, that the element spacing-to-length ratio must not exceed 1.3, and that an alpha/psi ratio of approximately 1 or higher must be maintained for proper operation of the antenna. All information gathered was combined into a nomograph to facilitate design work on log periodic antennas. (Author)

AD-266 791 Div. 8, 7
(TIPTE/NTM) OTS price $2.60

International Resistance Co., Hollywood, Calif.
MINI-BLOK MINIATURE RECTANGULAR METAL FILM RADIAL LEAD PRECISION RESISTOR.
Interim development rept. no. 2, 27 June-27 Sep 61,
by Benjamin Solow. 29 Sep 61, 21p. incl. illus. tables.
(Contract NObsr-85292)
Unclassified report

DESCRIPTORS: (*Resistors, Metal films, *Miniature electrical equipment, Miniature electronic equipment, Design, Lead, Printed circuits.) (Aluminum compounds, Oxides, Ceramic materials.)

Efforts were made to develop a plus or minus .05% miniature metal film resistor which should have a maximum volume of 5 x 1/10,000 cubic inches in a rectangular configuration with radial leads. The resistor shall be rated at 1/10 watt at 85 C ambient in ranges from 100 to 200,000 omega. Evaluation of Mycalex, Steatite, and Alumina substrates was completed, and Alumina was selected. A preliminary layout for evaporation was worked out. The ceramics are placed on a rotary heater with a filament source at a 60 degree angle from the horizontal plane of the heater. Design work was also done on substrate heaters, spray masks for gold termination, leads and tooling, molding, and an adjusting device. (Author)

AD-266 848 Div. 8, 26
(TIPTM/GEC) OTS price $1.60

Valpey Crystal Corp., Holliston, Mass.
INDUSTRIAL PREPAREDNESS STUDY. QUARTZ CRYSTAL UNIT CR-(XM-37)/U.
Quarterly progress rept. no. 1, 1 July-30 Sep 61,
by Norman R. Gillin. 30 Sep 61, 11p.
(Contract DA 36-039-sc-85972)
Unclassified report

DESCRIPTORS: (Industrial mobilization, *Quartz crystals, *Manufacturing methods, Production, Processing, Handling, Electronic equipment.) (Test equipment, Non-destructive testing, Electrical properties, Resistance, Electrostatic capacitances, Temperature.)

The CR-(XM-37)/U quartz crystal unit is a metal plated unit designed to operate at series resonance on the 7th mechanical overtone in the range of 150 to 200 mc. Holder type is the HC-18/U. Manufacturing this unit without resorting to screening and with a minimum of shrinkage points up the following problems (1) angular control through sawing process, (2) lapping and final polish, (3) methods of handling thin blanks, (4) frequency control for minimum finishing, (5) cleaning and base plating, (6) mounting thin blanks in holders, (7) cementing, and (8) correlation of final frequency test equipment with AN/TSM-15. Requirements satisfying these problems are listed. (Author)

AD-266 853 Div. 8, 26
(TIPTE/NTM) OTS price $11.00

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURES. DIFFUSED SEMICONDUCTOR DEVICES 7, 12 PLUS 2N559 AND 2N1094.
Quarterly progress rept. no. 16, 10 June-10 Sep 61, on Establishment of Production Design and The Pilot Line Production of Devices 7 and 12 plus the Mechanization of the 2N559 and 2N1094 Transistors,
by M. N. Reppert. 10 Sep 61, 140p.
(Contract DA 36-039-sc-72729)
Unclassified report

DESCRIPTORS: (*Semiconductors, *Transistors, Production, *Manufacturing methods, Industrial production, Design.) (Test equipment, *Machines, *Industrial equipment, Packaging, Computers.)

Research was continued on the production of diffused semiconductor devices. The can punching machine, the wafer to header bonding machine and a second strip perforating and welding machine were completed. All prove-in details of the 2N559 Testing and Packaging Machine were completed. Design was completed, but construction was delayed to determine if a similar machine, being built for another code, can perform the coating operation. The wafer screening machine, the gold wire handling and bonding machine and the holder loader remained in the prove-in phase. Five machines, in addition to the coating and second gold wire handling and bonding machines, are in various stages of design and/or build. Their status is summarized. (Author)

AD-266 870 Div. 8, 6, 26
(TIPTE/CRJ) OTS price $3.60

Electronics Research Labs., Columbia U., New York.
ADVANCED RADAR RESOLUTION TECHNIQUES RESEARCH ON ULTRASONIC DELAY LINES.
Technical progress rept., 3 Jan-31 June 61,
by L. Lambert. 1 July 61, 29p. incl. illus. 16 refs. (Rept. no. CU-18-61-AF-1971; ERL Technical rept. no. P-5/152)
(Contract AF 30(602)1971)
(RADC TN 61-113)
(ARPA Order no. 27) Unclassified report

DESCRIPTORS: (*Supersonic delay lines, Ultrasonics, *Radar equipment, Design, Manufacturing methods.) (Delay lines, Transducers, Quartz crystals, Lead, Bonding.) (Electromagnetic waves, Diffraction, Theory.)

Progress on the ultrasonic delay line research task is presented. An extension of the evaporation bonding technique with indium to include the application of indium backings is described. Experimental results obtained for the bandwidth and reflection coefficient of an AC cut quartz transducer and a delay medium of fused quartz are compared to theory. The initial results obtained using lead as a bonding and backing material are described. Techniques employed to bond with lead and the initial experimental results obtained are presented, and a significant improvement over the results achieved with indium is indicated. Theoretical results indicate further improvement when the bonding techniques used for lead are refined. Results of an investigation of the diffraction effects due to a rectangular transducer are presented. An experimental apparatus used to measure diffraction effects with a dynamic range in excess of 50 db is described. Results of a series of measurements on a bonded transducer indicate the transducer vibrates with essentially constant amplitude, with minor variations due to the bonding process. (Author)

AD-266 874 Div. 8
(TIPTW/RD) OTS price $11.50

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
OPERATIONS RESEARCH ON RECOGNITION. THE GENERALIZED SEARCH PROCESS,
by Robert D. Turner. Nov 61, 1v. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)6103)
(AFCRL-945) Unclassified report

DESCRIPTORS: (*Radar signals, *Radio signals, Identification, Detection, Mathematical analysis, Signal-to-noise ratio.) (Correlation techniques, *Information theory, Statistical distributions, Transformations (Mathematics), Probability.) Operations research.

Techniques for detection, analysis, and description of unknown recurrent signals are examined. Distributional search techniques (based on analysis of the empirical probability distribution of the input) are shown to have efficiences comparable to an unrealizable maximum-likelihood estimator, but become fairly complicated when a large amount of information about the unknown signal is required. Linear search techniques, exemplified by various types of adaptive filters, are examined analytically; results of a diagnostic adaptive filter simulation program are discussed. Linear search techniques yield fine-grain information about unknown signals more readily than the distributional techniques, but are subject to certain intrinsic limitations. Several alternative means for implementation of adaptive filters are presented, and the operational characteristics of a configuration employing cascaded adaptive filters are discussed. Hybrid techniques and a novel search technique based on certain transformation properties of probability distributions are discussed. (Author)

AD-266 875 Div. 8
(TIPTE/CDM) OTS price $2.60

ITT Federal Labs., Fort Wayne, Ind.
PRODUCTION ENGINEERING MEASURE FOR TYPE FW-202 BARRIER-GRID STORAGE TUBE.
Quarterly progress rept. no. 1, 1 July-30 Sep 61,
by J. M. Abraham. 31 Oct 61, 13p. incl. illus.
(Contract DA 36-039-sc-85967)
Unclassified report

DESCRIPTORS: (*Storage tubes, Production, Engineering, *Manufacturing methods, Test equipment, Maintenance.) (*Electron tubes, Design.)

Efforts are being directed toward a production engineering measure (PEM) for the FW-202 barrier-grid storage tube. The PEM program is in 3 phases; the preliminary engineering phase and the preproduction and pilot production phases. Preventive maintenance on the test equipment was completed. Investigations started on the use of low temperature alloys as a bonding agent between the barrier-grid mesh and the SE surface. Preliminary design was completed for mounting of the collector-amplifier section on a seal ring. An electronic evaporator was ordered and service installations were completed. (Author)

AD-266 877 Div. 8, 6
(TIPTP/JAP) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
APPLICATION OF STATISTICAL ESTIMATION PROCEDURES TO THE IDENTIFICATION PROBLEM,
by R. P. Wishner, and J. C. Lindenlaub.
3 Nov 61, 24p. incl. illus. (Rept. no. 47G-2)
(Contract AF 19(604)7400)
(ARPA Order no. 56-61)
Unclassified report

DESCRIPTORS: (*Identification systems, *Signal-to-noise ratio, Statistical analysis, Statistical processes.) (*Control systems, *Signal-to-noise ratio, Statistical analysis, Statistical processes, Integral equations, Matrix algebra, Errors.)

The method of maximum likelihood parameter estimation is applied to the problem of measuring parameters of an unknown linear filter or control system from input-output data when it is assumed that the output signal is corrupted with an additive Gaussian noise signal. The physical realization suggested by the integral formulation of the estimation technique is discussed and illustrated. Approximate expressions for the parameter estimates and the covariance matrix of the errors in the parameter estimates are obtained in the strong signal case. This analysis also has applications to the adaptive radar problem. (Author)

AD-266 901 Div. 8, 5
(TIPTE/CDM) OTS price $11.50

RCA Industrial Tube Products, Lancaster, Pa.
CONSTRUCTION OF A 25 WATT CERAMIC BEAM POWER TETRODE.
Final technical rept., 23 May 58-30 Apr 61,
by F. W. Peterson and J. J. O'Grady. 30 June 61, 154p. incl. illus. (Rept. no. 7)
(Contract DA 36-039-sc-78032)
Unclassified report

DESCRIPTORS: (*Tetrodes, *Beam power tubes, Oxide cathodes, Ceramic materials, Design, Production, Manufacturing methods.) (Electron tubes, Very high frequency, Radio communication systems, *Communication equipment, Electronic circuits.)

Efforts were devoted to the development of a ceramic-metal tetrode featuring coaxial construction and an oxide coated cathode. The tubes

are designed to deliver a minimum of three watts of drive power to the RCA-6884 over a frequency range of 30-76 mc with an input power of 50 milliwatts. The objectives were attained with the recently announced tube type RCA-7801, the specifications for which were released in January 1961. Life expectancy of several thousand hours is indicated by the life test program. The 6.3 volt heater version of this type is recommended for all applications using the RCA-7801 and its associated circuitry. (Author)

AD-266 908 Div. 8
(TIPTE/CDM) OTS price $2.60

Transistor Applications, Inc., Boston, Mass.
RESEARCH DIRECTED TOWARD ANALYSIS AND DESIGN OF TRANSISTOR CIRCUITS.
Scientific rept. no. 7, 1 Dec 60-28 Feb 61, by A. W. Carlson. July 61, 18p. incl. illus.
(Contract AF 19(604)4089)
(AFCRL-598) Unclassified report

DESCRIPTORS: (*Transistors, *Electronic circuits, Delay lines, Design, Theory.) (Nonlinear systems, Mathematical analysis, Partial differential equations, Diodes.)

Voltage waveforms in a 34-section non-linear line using reverse biased junction diodes as nonlinear shunt capacitor elements are compared with waveforms calculated using the solution obtained for the uniform, lossless, distributed line. The comparison was in good agreement outside of regions where the mathematical solution is multivalued. With fast rising waveforms, in which the mathematical solution becomes multivalued in a short distance, the delay in the line is observed to be reduced relative to a signal having a slower rise time. The step response to a lossless L-C(v) circuit in which C(v) has the form of a reverse bias step-junction diode is presented. From the behaviour of the L-C(v) circuit, it is deduced that the delay time of the wavefront in a lumped nonlinear line made up of L-C(v) sections would be a decreasing function of the amplitude of an input step function. (Author)

AD-266 939 Div. 8, 5
(TIPTP/JW) OTS price $2.60

Columbia U. School of Engineering, New York.
OPTIMUM ZERO-MEMORY FILTERS,
by L. I. Bluestein and R. J. Schwarz. 1 Oct 61, 21p. incl. illus. (Technical rept. no. 68; CU-17-61-Nonr-266(60)-EE)
(Contract Nonr-26660, Proj. NR 049-134)
Unclassified report

DESCRIPTORS: (Probability, Equations.) (*Information theory, *Radio signals, *Signal-to-noise-ratio, Radiofrequency filters, Errors.)

Defining equations for the optimum zero memory filter are derived using the mean absolute error criterion. It is shown that the characteristic of this filter is antisymmetric about a certain point when the signal and noise densities have symmetry properties. The coordinates of this point are found. The direct connection filter is found to be non-optimal in all cases of interest; consequently the need for filtering is shown to be a quantizer for quantized signals and a method of obtaining the characteristic of this filter is developed when the signal has a finite number of levels. (Author)

AD-266 940 Div. 8
(TIPTE/CRJ) OTS price $12.00

Electronics Research Labs., Columbia U., New York.
MULTIPLE SIGNAL COUNTING,
by Wilbert M. Gersch. 28 July 61, 160p. incl. illus. 12 refs. (Technical rept. no. T-1/161; CU-21-61-AF-1971-ERL)
(Contract AF 30(602)1971)
(RADC TN 61-218)
(ARPA Order no. 27) Unclassified report

DESCRIPTORS: (*Radar signals, *Noise (Radar), Signal-to-noise ratio, Statistical analysis, Mathematical analysis, Analysis, Theory.) Data processing systems.

This research is concerned with estimation of the number of signals present in a sample containing signals plus noise. The signal sample is divided into M cells, of which N contain signals and noise, and (M-N) contain noise alone. The signals are assumed distributed in amplitude, with the distribution known to within p parameters. The noise statistics are assumed known. The observable quantities are R sub i, (i = 1,2,...,M) the magnitude of the envelope of the cell contents. The problem is one of parameter estimation, called Multiple Signal counting, which is an idealized model for a radar operating in a multiple signal environment. (Author)

AD-267 010 Div. 8, 25, 17
(TIPTM/EJH) OTS price $9.60

Thermo Electron Engineering Corp., Waltham, Mass.
THERMIONIC EMITTER MATERIALS RESEARCH PROGRAM.
Quarterly rept. no. 1, 1 July-30 Sep 61. 30 Sep 61, 140p. incl. illus. (Rept. no. TEE-4015-1)
(Contract Nonr-356300)
Unclassified report

DESCRIPTORS: (*Diodes, Electron tubes, Cesium electron tubes, Materials, Metals, *Refractory materials, Metal coatings, Cesium, *Thermionic emission, Voltage, Cooling, Operation.) (Cesium, Vapors, Thermal conductivity.) (Test methods, Test equipment.)

Contents:
Electrical characteristics
  General
  I-V characteristics
  Work function
  Ion currents
  Ignition
Thermal characteristics
  Cesium conduction
  Electron cooling
  Radiation
Power and efficiency
Spacing
Test vehicle
Test set-up and instrumentation
Test procedures
Cesium corrosion study
Thermodynamic derivation of the dependence of cesium arrival rate upon emitter surface temperature

AD-267 014 Div. 8
(TIPTM/DLW) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
PRIMARY PATTERN MEASURE OF A LINE SOURCE FEED

FOR A SPHERICAL REFLECTOR,
by Edward E. Altshuler. Aug 61, 12p. incl. illus. (Rept. no. AFCRL 706)
(Proj. no. 4600)

Unclassified report

DESCRIPTORS: (Reflectors, Spheres, Radar reflectors, Surface area, Phase measurement, *Antenna radiation patterns, Measurement, Test methods.) (Antennas, Transmission lines, Geometry, Optics, Design.)

In designing a line source feed for a spherical reflector, it is customary to determine the field distribution across the aperture by measuring the primary pattern (amplitude and phase of the field on the surface of the reflector) of the line source. This measurement becomes extremely difficult when the reflector is large since either a precision circular track or a long rigid beam is required. Using geometric optics it is shown that the amplitude and phase at the aperture can be determined from the amplitude and phase measured when the line source is rotated about its paraxial focus. Since all that is required to make the measurement is a turntable and a stationary pickup probe, the experimental setup is considerably simplified. (Author)

AD-267 015 Div. 8
(TIPTE/CDM) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
THE BACKFIRE ANTENNA, A NEW TYPE OF DIRECTIONAL LINE SOURCE,
by Hermann W. Ehrenspeck. Aug 61, 27p. incl. illus. table (Rept. no. AFCRL 722)
(Proj. no. 4600)

Unclassified report

DESCRIPTORS: (*Antennas, Antenna radiation patterns, Electromagnetic waves, Wave transmission, Design, Tests.) (*Radar antennas, Dipole antennas, Coupled antennas, Reflectors, Design.)

A description is given of the backfire antenna, a new type surface-wave radiator which consists of an ordinary endfire structure (Yagi, dielectric rod, and so forth) terminated by a plane reflector. The surface wave launched at the feed travels along the endfire structure until it impinges on the reflector; it then travels back toward the feed and radiates into space in a direction opposite to that of normal endfire operation. The gain of the backfire antenna is between 4 and 6 db higher than that of an ordinary endfire antenna of the same length; conversely, to achieve the same gain, the backfire antenna needs to be only between 1/4 to 1/3 as long as the ordinary endfire antenna. The side and back lobes can be kept extremely low. The backfire antenna will have wide application in cases in which the transverse dimension of the reflector does not violate stringent low-silhouette requirements. (Author)

AD-267 016 Div. 8
(TIPTE/NTM) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
LARGE SPHERICAL ANTENNAS FOR AEROSPACE RESEARCH.
by Edward E. Altshuler. Aug 61, 18p. incl. illus. (Rept. no. AFCRL 745)
(Proj. no. 4600)

Unclassified report

DESCRIPTORS: (Space probes, Spaceships, Satellite vehicles, *Research test vehicles, *Space flight, Control systems, Command systems.) (*Antennas, Illumination.) (*Radar antennas, Reflectors, X band, Design.)

Command and control of deep-space vehicles are contingent on high-gain high-resolution steerable antennas. The beam of a large spherical antenna can be steered simply by moving the feed. Illuminating the reflector with a line source feed corrects for spherical aberration. The primary and secondary patterns of a 10-ft spherical reflector illuminated by an X-band line source showed reasonably good correlation in the H plane. In the E plane, the primary pattern was degraded by a phase error resulting from astigmatism. Conditions of the experiment precluded prediction of the distance the line source would have to be moved to bring the E-plane patterns into focus. (Author)

AD-267 020 Div. 8
(TIPTP/WH) OTS price $5.60

Electronic Defense Lab., Mountain View, Calif.
STATISTICS OF PHASE QUADRATURE COMPONENTS OF MICROWAVE FIELD TRANSMITTED THROUGH A RANDOM MEDIUM.
by C. I. Beard. 15 Sep 61, 52p. incl. illus. tables (Technical memo. no. EDL-M402)
(Contract DA 36-039-sc-87475)

Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Microwave, *Scattering, Absorption, Attenuation, Refraction.) (Gases, Spheres, Electromagnetic wave reflection.) (Microwaves, Gases, Pressure, Absorption.)

The phase quadrature components of the total microwave field transmitted through a random volume distribution of Styrofoam spheres was measured. The radii of the spheres were large compared to the wavelength, and their index of refraction was close to unity. The statistical results in the mid-field region led to the bivariate normal distribution with correlation to describe the scattered incoherent field, rather than to the simpler Rayleigh distribution. Departures of the incoherent field from the Rayleigh distribution were a function of the sum of the reciprocal transmitter and receiver distances. This behavior suggested that in the mid-field region the departures are related to the sphericity of the transmitting and receiving beams. (Author)

AD-267 022 Div. 8
(TIPTE/CDM) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RESEARCH STUDIES ON PROBLEMS RELATED TO ECM ANTENNAS.
Quarterly engineering rept. no. 12, 1 June-31 Aug 61.
30 Sep 61, 8p. incl. illus.
(Contract AF 33(616)6079, Proj. 9-(13-6278))

Unclassified report

DESCRIPTORS: (*Dipole antennas, *Helical antennas, *Conical antennas, *Coupled antennas, Antenna radiation patterns, Electromagnetic properties, Impedance.) (*Antennas, Design, Mathematical analysis, Countermeasures, *Bibliography.)

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High resolution antenna techniques at 100 kmc to 400 kmc frequencies

AD-267 029 Div. 8
(TIPTB/CW) OTS price $9.10

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
GLOSSARY OF TECHNICAL TERMS IN THE AGEP AREA OF INTEREST.
May 60, 105p. 80 refs. (Rept. no. GEP 251/1)
Unclassified report

DESCRIPTORS: (*Dictionaries, *Electronics.)

This Glossary of Technical Terms was compiled with the idea of providing assistance in keeping up with the rapidly expanding vocabulary of electronics. Basic terms have been omitted deliberately, as have those which apply primarily to the area of tubes and transistors. Emphasis is heavy on those terms which pertain to materials and to electrophysical phenomena. Sources of all definitions are clearly indicated and in many instances more than one definition has been provided. A breakdown of commonly-used abbreviations may be found in the appendix of this document. (Author)

AD-267 045 Div. 8
(TIPTE/NTM) OTS price $3.50

Electronic Research Lab., U. of Calif., Berkeley.
LARGE-SIGNAL TRAVELING WAVE TUBE OPERATION: CONCEPTS AND ANALYSIS.
Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components, by Robert L. Hess. July 61, 222p. incl. illus. tables, 29 refs.
(Contract AF 33(616)6139, Proj. 4150)
(ASD TR 61-15) Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Microwave amplifiers, Operation, Beam power tubes, Theory, Physical properties, Space charges, Electronic circuits, Equations.) (Circuits, *Electron tubes, Electron beams, Radiofrequency power, Mathematical analysis.) (Computers, Digital computers, Data processing systems, Errors, Numerical analysis.)

A large-signal traveling-wave tube theory is derived, with special emphasis on physical concepts and on relating points of view from various analyses. The theory is one dimensional and includes effects of space charge and circuit loss. Special attention is paid to interpretation of terms in equations for power balance. A running comparison is made with work of Tien, Rowe, and others. The circuit equations of Pierce and Bernier are compared, and it is shown how both yield the same answers if symbols for physical quantities are properly interpreted. Space-charge forces are calculated from a compressible-block model, an extension of Tien's disk model with continuous charge distribution between disks. A simplified theory is derived, neglecting the effects of any backward-wave component on the circuit; resulting computations compare well with those of other theories. All quantities are normalized to cold-circuit voltage rather than beam voltage. Using calculated large-signal data, saturation power and maximum RF bunching of the beam are studied as functions of space charge, loss, RF drive, injection velocity, and gain parameter C. (Author)

AD-267 048 Div. 8
(TIPTE/NTM) OTS price $1.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
TRAVELING WAVE TUBE ATTENUATOR STUDY.
Final rept. for June 59-Oct 60 on Research on Traveling Wave Tube Attenuators, by M. Ettenberg, O. Lipszyc, and H. Schleuning. Aug 61, 32p. incl. illus. tables (Rept. no. PIBMRI-888-60)
(Contract AF 33(616)6626, Proj. 4156)
(WADD TR 61-125) Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Radiofrequency attenuators, Helixes, Integration, Structures, Power, Tests, Manufacturing methods, Mathematical analysis.) (Electron tubes, Electrostatics, Metal films, Materials.)

The novel technique of manufacturing a helix-attenuator integrated structure is described. The calculations performed indicate that the power-handling capabilities of such a structure are very good and the tests made seem to confirm the belief that such a structure is well worth exploring, especially when such a tube, focused by electrostatic means inside the vacuum, could be cooled by being immersed in a circulating coolant. The reproducibility of the structure with very good tolerances is deemed to be feasible. The data given here are based on exploratory experiments rather than on the improved technique. (Author)

AD-267 064 Div. 8, 12
(TIPTW/DLW) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
RIDGE WAVEGUIDE RADIATORS FOR MISSILE ANTENNA APPLICATIONS,
by Walter Rotman and Nicholas Karas. June 61, 21p. incl. illus. 16 refs. (Rept. no. AFCRL-376)
(Proj. 4600) Unclassified report

DESCRIPTORS: (*Guided missile antennas, SLDT antennas, *Waveguides, Transmission lines, *Radar scanning, Airborne, Theory, Design.) (Antennas, Guided missiles, Radar equipment.)

Ridge waveguide antennas are radiating structures consisting of a waveguide with a movable center ridge. Movement of the ridge changes the phase velocity of the electromagnetic energy in the waveguide, the emergent radiated beam being thereby scanned in the elevation plane. The angle of the beam, which radiates through transverse shunt slots, is controlled by mechanically varying the height of the ridge. Such antennas are structurally suitable for flush-mounting on the cylindrical section of a missile. Judging from the range of the scan angle, simplicity of construction, and ease of operation, the T-ridge waveguide is apparently more satisfactory than the rectangular- and semi-circular-ridge waveguides. (Author)

AD-267 066 Div. 8, 7
(TIPTE/CDM) OTS price $3.00

Emerson Radio and Phonograph Corp., Jersey City, N. J.
R-F AND I-F TRANSFORMERS, MINIATURIZED, FOR TRANSISTORS (WIDE BAND I-F AMPLIFIERS).
Summary rept. for 23 June 59-22 June 60 on Thermionics and Solid State Electronic Technology,
by Alfred Ossoff. Nov 60, 141p. incl. illus. tables.
(Contract AF 33(600)39628, Proj. 4156)
(WADD TR 60-679) Unclassified report

DESCRIPTORS: (*Transistors, Electronic circuits, *Intermediate frequency transformers, *Radiofrequency transformers, *Miniature electrical equipment, Silicon, Design.) (*Transistor amplifiers, *Intermediate frequency amplifiers, Broadband, Design.) (Diodes, Amplifiers, Circuits, Tests.)

A description is given of miniaturized lightweight inductive components and associated networks developed for use in wideband transistorized IF amplifiers which will provide highly stable characteristics over the temperature range of -65 to +200 C. Silicon transistors limit the upper temperature range to 130 C. Other components perform to 200 C. An investigation of the effects of the wide temperature ranges upon the transistorized circuits was conducted. A method of compensating the transistor gain-temperature characteristics was developed and tested. A wide range of agc control was successfully achieved with minimum effect upon the IF amplifier characteristics. Transistorized circuits for agc control with pulsed signals were developed. The mechanical design of each amplifier provides a small, rugged, lightweight package that may be hermetically sealed. The electrical design has provided simple alignment that will accommodate the normal spread in transistor parameters without modification. (Author)

AD-267 075 Div. 8
(TIPTE/NTM) OTS price $4.60

Compagnie Generale de Telegraphie Sans Fil (France).
SUPERDIRECTIVE ANTENNAS AT LOW FREQUENCIES,
by Erich Spitz. 31 Jan 61, 37p. illus. (Technical rept. no. 1815 RS)
(Contract AF 61(052)387)
(AFCRL-561) Unclassified report

DESCRIPTORS: (*Dipole antennas, Microwave equipment, *Low frequency, Reflectors, Theory, Synthesis, Design.) (*Antenna radiation patterns, Mathematical analysis, Measurement.)

A broadside superdirective antenna consisting of 5 sources was constructed in the 100 mc band. Though a superdirectivity factor of about 2 was obtained, no supergain appeared. Thus the feasibility of superdirectivity for low frequencies was proved, but its application is limited, because of the low energy efficiency. It is possible that for some application where space economy prevails efficiency considerations, and where only a narrow band is needed, for example altimeter antennas in aircrafts, a superdirective antenna can be a solution. (Author)

AD-267 086 Div. 8
(TIPTE/CDM) OTS price $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS.
Quarterly progress rept. no. 9, 1 Apr-30 June 61,
by M. Roux and K. Rose. 15 July 61, 29p. incl. illus. table.
(Contract DA 36-039-sc-78313, Proj. 3-99-15-104)
Unclassified report

DESCRIPTORS: (*Microwave equipment, *Radar duplexers, Electronic switches, *Switching circuits, Tests.) (Magnetohydrodynamics, Plasma physics, Gas discharges, Gas ionization, *Semiconductors, Shock waves, Mathematical analysis, Measurement, Test equipment.)

The study of the velocity of the discontinuities produced at the end of a tube by a high power RF pulse and propagating in a plasma was continued. A new geometry, characterized by a variation in the cross section of the tube, was tested. A new perturbation, propagating at an unusually high velocity, was identified as a shock wave. Its velocity is in close agreement with that predicted by the theory. Experiments, involving the known phenomenon of charge exchange collisions between particles with different ionization potential, were performed to determine the sonic or ionic wave character of observed discontinuities. The propagation velocity of the discontinuities in pure gases and pure gases admixed with small amount of impurities was compared. In some gas mixtures, a decrease of the velocity towards the sound velocity in the impurity gas at room temperature was observed, but this result is not evident enough to assert the presence of an ionic wave in the plasma. The qualitative theory is given and the results are discussed. (Author)

AD-267 089 Div. 8, 5, 30
(TIPTE/CRJ) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
STUDIES OF TOPOLOGICAL SYNTHESIS.
Final rept. 1 Sep 55-31 Aug 61,
by M. E. Van Valkenburg and S. L. Hakimi.
1 Sep 61, 14p.
(Contract DA 11-022-ORD-1983, Proj. TB2-0001)
(AROD rept. no. 2207:14) Unclassified report

DESCRIPTORS: (*Electrical networks, *Switching circuits, *Communications theory, *Topology, Synthesis.) (*Radio communication systems, Circuits, Mathematical analysis, Reliability.) (*Digital computers for Analysis.)

Efforts are presented in the following 5 areas: (1) topological and other properties of networks, (2) network synthesis, (3) application of the digital computer to analysis and synthesis, (4) switching networks, and (5) radio and communication networks. Topology played a major role in each of these areas. Many of the contributions were purely topological in nature and others made use of topological techniques. (Author)

AD-267 090 Div. 8
(TIPTE/CRJ) OTS price $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
ON SIMULTANEOUS FLOWS IN A COMMUNICATION NETWORK.
Interim technical rept. no. 20,
by S. L. Hakimi. 1 Sep 61, 22p. incl. illus. 13 refs.
(Contract DA 11-022-ORD-1983, Proj. TB2-0001)
(AROD rept. no. 2207:12)
Unclassified report

DESCRIPTORS: (*Communications theory, *Information theory, Linear programming, Numerical methods and procedures, Mathematical analysis.)

A generalization is presented of the results of Elias, Feinstein, and Shannon, and Ford and Fulkerson on the maximum rate of information flow through a communication network. The problem is the followig: Suppose a fixed rate of flow of information is being maintained between stations A and B of a communication network, then (1) what is the maximum rate of flow between another pair of stations C and D of the same communication network, and (2) how can one allocate, among the channels, the original load on the communication network to obtain the maximal flow between stations C and D. Within certain determinable limits the sum of these 2 rates of flow remains a constant. A technique for attaining the maximal flow between stations C and D based upon the linear programming is described. A solution of the generalization of this problem to the case of k simultaneous flows is also presented. (Author)

AD-267 096 Div. 8
(TIPTE/CRJ) OTS price $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
FREQUENCY SEPARATION AND GENERATION OF ENERGY AT MILLIMETER AND SUBMILLIMETER WAVELENGTHS.
Rept. on Study of Electromagnetic Radiation,
by E. K. Damon and R. E. Whitacre. 1 Sep 61, 33p. incl. illus. table (Rept. no. 1083-9)
(Contract AF 33(616)7081, Proj. 1083)
Unclassified report

DESCRIPTORS: (Radiofrequency spectrum analyzers, Microwave frequency, *Microwave spectroscopy, Mathematical analysis.) (*Radiofrequency generators, *Microwaves, *Frequency multipliers, Semiconductors, Diodes, Silicon, Crystals, Design.) (Diffraction gratings, Microwaves.) Communications theory.

A grating spectrometer utilizing an echelette-type reflection grating is described as a means of separating harmonics at millimeter and submillimeter wavelengths. Diffraction patterns obtained from the spectrometer at a wavelength 4.2 mm are presented. Harmonic generation using nonlinear semiconductor devices as multiplying elements is reviewed and the application of the various devices at millimeter wavelengths is discussed. (Author)

9. FLUID MECHANICS

AD-266 261 Div. 9, 25
(TIPTP/MFA) OTS price $1.10

California U., Los Angeles.
FLUID MOTION AND SOUND.
Annual summary rept. 1 May 60-30 Apr 61,
by Alan Powell. Oct 61, 6p. (Rept. no. 61-69)
(Contract Nonr-23362, Proj. NR 062-299/1-28-60)
Unclassified report

DESCRIPTORS: (Jets, Feedback, Acoustics, Sound transmission, Aerodynamics, Vortices, Turbojet engines, Boundary layer, *Sound, *Fluid flow.) (Abstracting, Scientific reports, Research program administration.)

AD-266 271 Div. 9
(TIPTA/WAW) OTS price $9.60

Douglas Aircraft Co., Inc., El Segundo, Calif.
SOLUTION OF THE INCOMPRESSIBLE LAMINAR BOUNDARY LAYER EQUATIONS,
by A. M. O. Smith and Darwin W. Clutter.
29 July 61, 114p. incl. illus. tables, 34 refs.
(Rept. no. ES 40446)
(Contract NOw 60-0533-c)
Unclassified report

DESCRIPTORS: (Gas flow, Axially symmetric flow, *Boundary layer, *Laminar boundary layer, Turbulent boundary layer, Mathematical analysis, *Boundary layer control.) (Boundary layer, *Heat transfer, Mathematical analysis, Equations, Theory.) (Bodies of revolution, Boundary layer, Airfoils, Boundary layer control.) *Fluid flow, Separation.

A method is developed for the numerical solution of the incompressible laminar boundary layer which is completely general for two-dimensional and axially symmetric flows. The method, based on some work originally done in 1937 by Hartree and Womersley of Great Britain, consists of replacing the partial derivative with respect to the flow direction by finite differences while retaining the derivatives in a direction normal to the boundary, so that the partial differential equation becomes approximated by an ordinary differential equation. The method was programmed on the IBM 704 and solutions for a wide variety of flows are presented. The mathematics of the solution, behavior of the process of solution, and its difficulties are discussed. Comparisons are made with other exact and approximate methods of solution. Application of the method to several current engineering problems is presented. A large number of calculations establish the fact that the method is very powerful and appears capable of solving any flow problem for which the boundary layer equations themselves remain valid. Accuracy appears good but it is difficult to establish with certainty because of the extreme scarcity of general exact solutions needed for comparison purposes. (Author)

AD-266 370 Div. 9
(TIPTP/JW) OTS price $7.60

Engineering-Physics Co., Rockville, Md.
STUDY OF BULK CAVITATION AND CONSEQUENT WATER HAMMER.
Final rept.,
by Vincent Cushing. 31 Oct 61, 72p. incl. illus. tables.
(Contract Nonr-338900)
Unclassified report

DESCRIPTORS: (*Fluid mechanics, *Cavitation, Particles, Pressure, Velocity, Density.) (Shock waves, Spallation.) (Water waves, *Underwater explosives.)

A detailed study was made of the mechanics or physics of bulk cavitation; its general similarity to the phenomenon of spalling was noted. A one-dimensional system of equations, describing the bulk cavitation phenomenon, was used for a variety of conditions by means of numerical methods on a machine computor. Pressure, particle velocity, and density throughout the cavitated and uncavitated regions were ascertained. The magnitude and duration of secondary pressure waves, occurring at the closure of bulk cavitation, is estimated. (Author)

AD-266 375 Div. 9, 1, 12
(TIPTA/LSK) OTS price $2.75

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
TRANSIENT AND NONLINEAR EFFECTS ON HIGH SPEED, VIBRATORY, THERMOELASTIC INSTABILITY PHENOMENA.
Rept. for 15 Jan 59-May 60 on Dynamic Problems in Flight Vehicles,
by Eugene J. Brunelle, Jr. Dec 60, 117p. incl. illus. tables, 11 refs.
(Contract AF 33(616)6185, Proj. 1370)
(WADD TR 60-484, pt. 2)
Unclassified report

DESCRIPTORS: (Satellite vehicles, Spaceships, Hypervelocity vehicles, Manned, Wings, Airframes, Supersonic airfoils, *Aerodynamics, *Aerodynamic configurations.) (*Aerodynamic heating, Elasticity, Plasticity, Airframes, Vibration, Deflection, Stability, Operational calculus, Computers.)

Research concerns the formulation and investigation of the equations representing the dynamic, torsion-bending motion of a wing which is one major component of an ultra-high performance manned vehicle. Preliminary work required for this investigation is included as an integral part of the report. This preliminary work includes (1) the derivation of an exact two-dimensional linearized aerodynamic theory for an accelerating unsteady supersonic airfoil, (2) the re-derivation of piston theory aerodynamics for arbitrary motion, and (3) a derivation for the torsional stiffness loss of an aircraft wing that includes the effects of a specified time-dependent wall temperature due to the given flight mission and that includes the effects of mid-plane stretching. The computer studies consider a super X-15 type wing performing two specified flight missions and provide answers in the form of pitch and plunge impulse response time histories. The exact solutions are compared with two approximate solutions. Results indicate a quasi-steady aero-thermoelastic analysis is adequate for manned vehicles of the foreseeable future. (Author)

AD-266 411 Div. 9, 1
(TIPTA/WAW) OTS price $11.00

Republic Aviation Corp., Farmingdale, N. Y.
THEORETICAL INVESTIGATION OF DUCTED PROPELLER AERODYNAMICS, VOLUME III,
by Th. Theodorsen and G. Nomicos. Sep 61, 138p. incl. illus.
(Contract DA 44-177-tc-674; Continuation of Contract DA 44-177-tc-606)
(TCREC TR 61-119) Unclassified report

DESCRIPTORS: (*Vertical take-off planes, Design.) (*Shrouded propellers, Aerial propellers, Theory, Mathematical analysis.) (Sheets, Jets, Deflection, Mathematical analysis.) (Vertical take-off planes, Jets, Jet mixing flow, Lift, Moments, Interference, Model tests.) (*Guide vanes, Mathematical analysis, Model tests.) (Vortices, Mathematical analysis.) Aerodynamics, Subsonic flow.

Problems of the ducted fan and its application in VTOL aircraft are investigated. General considerations are presented for the design of vertical take-off aircraft. The ideal loading of single rotation propellers in a circular duct is examined. The flow field was derived for a non-uniform sink distribution in a circular disk and for a cylindrical non-uniform vortex sheet. The velocity field and forces on a flat plate due to a cylindrical jet with an elliptical cross-section were also derived. Experimental data are given in tabular and graphic form on the interference effect of a jet on the VTOL aircraft. Design requirements of deflection vanes are discussed with the results of an experimental investigation on a cascade of circular arc sections. (Author)

AD-266 413 Div. 9, 25, 30
(TIPTP/MFA) OTS price $5.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
LOW-DENSITY STAGNATION-POINT HEAT TRANSFER IN HYPERSONIC AIR FLOW,
by C. E. Wittliff and M. R. Wilson. Feb 61, 52p. incl. illus. 51 refs. (Rept. no. AF-1270-A-3)
(Contracts AF 33(616)6025, Proj. no. 7064 and Nonr-265300)
(ARL-TR-60-333) Unclassified report

DESCRIPTORS: (*Boundary layer, Density, Heat transfer, Hypersonic flow.) (Gas flow, *Aerodynamic heating, *Shock tubes.) Superaerodynamics.

Stagnation-point heat transfer to two- and three-dimensional bodies at low Reynolds numbers was studied to obtain hypersonic low-density data and to demonstrate the suitability of the hypersonic shock tunnel as a facility for research in rarefied gasdynamics. Low-density experiments on a transverse cylinder and a hemisphere cylinder were made in air at Mach numbers from 8.4 to 11.6 in the CAL 11- by 15-inch hypersonic shock tunnel. The stagnation pressure and temperature, as well as model diameter, were varied to obtain a range of Reynolds numbers from 11 to 1000, based on flow conditions behind the bow shock wave and model radius. The experimental heat-transfer rates are presented and compared with theoretical predictions. The data obtained with the transverse cylinders are in good agreement with continuum boundary-layer theory at all but the lowest Reynolds numbers and highest Knudsen numbers. The hemisphere-cylinder data indicated the presence of a significant vorticity-interaction effect. Good agreement with the theoretical analysis of H. K. Cheng accounting for this effect is indicated. (Author)

AD-266 422 Div. 9, 1
(TIPTA/WAW) OTS price $9.10

Republic Aviation Corp., Farmingdale, N. Y.
THEORETICAL INVESTIGATION OF DUCTED PROPELLER AERODYNAMICS VOLUME IV,
by J. Sinacori and A. Lange. Sep 61, 107p. incl. illus.
(Contract DA 44-177-tc-674; Continuation of Contract DA 44-177-tc-606)
(TCREC TR 61-120) Unclassified report

DESCRIPTORS: (*Vertical take-off planes, Design.) (*Shrouded propellers, Aerial propellers, Aerodynamics, Effectiveness, Mathematical analysis.) Flying platforms.

The performances of VTOL aircraft using ducted and free propellers are compared. The comparison is based on existing light VTOL aircraft equipped with ducted propellers and on the same aircraft using free propellers computed for this purpose. The free propellers appear to provide better aircraft performance, especially higher flight

speed. An appraisal and analysis of VTOL aircraft based on the existing VTOL testbeds forms the second part of this volume. Summaries of design particulars and performance are given in graphical and tabular form. The special purpose vehicles, such as the flying jeeps, aerial platforms and aerodynes, are treated as a separate group. Particular performance data of the various VTOL aircraft are collected in an appendix. (Author)

AD-266 501 Div. 9
(TIPTP/JDP) OTS price $4.60

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
THE METHOD OF INTEGRAL RELATIONS FOR CONICAL FLOW - THEORETICAL ANALYSIS,
by John W. Brook. Oct 61, 40p. incl. illus. 20 refs. (Research memo. no. RM-193)
(Contract AF 33(616)6400)
Unclassified report

DESCRIPTORS: (Fluid mechanics, *Gas flow, *Aerodynamics, Mathematical analysis, Integral equations, Differential equations, Partial differential equations.) (*Shock waves, Conical bodies, Triangular wings, Mathematical analysis, Differential equations.)

The gas dynamic equations in orthogonal conical coordinates are integrated across one strip, following the idea of Dorodnitsyn's method of integral relations. Although no numerical results are obtained, a discussion of the resulting ordinary differential equations for the case of an elliptic cone and a flat-plate delta wing is presented. (Author)

AD-266 559 Div. 9
(TIPTP/MFA) OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
MEASUREMENT OF AERODYNAMIC CHARACTERISTICS OF RE-ENTRY CONFIGURATIONS IN FREE FLIGHT AT HYPERSONIC AND NEAR-ORBITAL SPEEDS.
Technical rept. on Flight Sciences,
by R. L. Nelson. July 61, 39p. incl. illus.
(Rept. no. 6-90-61-37)
Unclassified report

DESCRIPTORS: (*Re-entry aerodynamics, Re-entry vehicles, *Aerodynamic configurations, Free-fall missiles, Orbital flight paths, *Hypersonics, Bodies of revolution, Flight testing, Yaw, Flight speeds.) (*Aerodynamic data, Digital computers, Nonlinear systems, Equations, Bessel functions.)

The measurement of aerodynamic characteristics of re-entry body configurations in re-entry flight at very high speeds has required extensions of techniques developed earlier for aircraft and low-speed missiles. This analysis presents the extensions made possible by the recent theoretical studies of re-entry mechanics and dynamics and their application to flight measurements. Emphasis is placed on the reduction of flight oscillation data to obtain static pitching moment and damping data. Highly nonlinear characteristics are assumed. Through application of the procedure to two cases (flight data and a digital-computer solution), the reduction technique is shown to be adequate for re-entry configurations trimmed about zero angle-of attack. (Author)

AD-266 564 Div. 9
(TIPTP/MA) OTS price $6.60

Max-Planck-Institut fuer Stroemungsforschung (Germany).
EXPERIMENTAL INVESTIGATIONS ON THE SCATTERING OF SOUND BY TURBULENCE.
Technical rept.,
by Dieter W. Schmidt. July 61, 60p. incl. illus. 27 refs.
(Contract AF 61(514)1143)
(AFOSR-1666)
Unclassified report

DESCRIPTORS: (*Sound, *Scattering, Vortices, *Turbulence, Turbulent flow, Frequency, Instrumentation, Damping, Ultrasonics, Semiconductors, Pressure, *Wind tunnels.) *Bibliography.

Experimental investigations of the scattering of sound by turbulence were performed in a wind tunnel. Turbulence was produced by grids of parallel circular rods (with diameters of 0.1 to 1.0 cm and grid meshlengths of 0.5 to 2.5 cm); the sound frequencies covered a range of 100 to 500 kc. Disturbances of the measurements due to reflections of sound waves at the tunnel walls were avoided by the application of short sound pulses. The dependence of the damping of the sound waves on the sound frequency, the Mach number of the turbulence, the length of the sound path in the turbulent flow and a predominant direction of the turbulent eddies was measured. Theoretical predictions were confirmed and partly extended. In the range of the parameters which is of interest for practical use the most important results are the proportionality of the damping to the square of the sound frequency and to the square of the turbulent Mach number. Based on the measurements and the theoretical considerations, a formula is derived which is applicable to the damping of sound by turbulent scattering in the atmosphere. (Author)

AD-266 566 Div. 9
(TIPTA/WAW) OTS price $6.60

Vehicle Research Corp., Pasadena, Calif.
A LIFTING SURFACE THEORY FOR WINGS EXTENDING THROUGH MULTIPLE JETS,
by T. Yao-tsu Wu and Richard B. Talmadge.
10 Aug 61, 66p. incl. illus., 16 refs. (VRC rept. no. 8)
(Contract Nonr-238800)
Unclassified report

DESCRIPTORS: (*Wings, Lift by Downwash.) (*Aerial propellers, Jets, Wake, Downwash, Deflection.) (*Aerodynamics, Vortices, Mathematical analysis, Differential equations, Partial differential equations, Integral equations, Potential theory, Theory.)

The basic Rethorst (J. Apro. Sci., 25, No. 1: 11-28, 1958) lifting surface solution of a wing extending through a single jet was generalized to enhance its applicability to the solution of many general and secondary problems concerned with the non-uniform aerodynamics of wing-propeller interaction. The generalization is first developed in detail in terms of single jet theory. Then it is applied to multi-jet arrangements. Several significant refinements to the original Rethorst theory are introduced. The wing is represented by a distribution of infinitesimal vortex elements instead of a large but finite number of horseshoe vortices. Certain symmetry restrictions are removed and the effect

of slipstream rotation is included. The spanwise lift distribution of an example multi-jet arrangement was determined. Large increases in lift inboard and within the jets were obtained when the free stream velocity was small compared to the jet velocity. A lesser but significant increase occurred outboard of the jets. This large lift magnification offers the potential of large improvements in STOL capabilities. (Author)

AD-266 568 Div. 9, 25
(TIPTP/MFA) OTS price $6.60

Heat Transfer Lab., U. of Minn., Minneapolis.
MEASUREMENT OF HEAT TRANSFER FROM A CIRCULAR CYLINDER TO AN AXIAL STREAM WITH AIR INJECTION INTO A TURBULENT BOUNDARY LAYER,
by O. E. Tewfik, E. R. G. Eckert, and L. S. Jurewicz. Aug 61, 57p. incl. illus.
(Technical rept. no. 38)
(Contract AF 49(638)558)
(AFOSR-1397) Unclassified report

DESCRIPTORS: (*Heat transfer, *Boundary layer control systems, Thermal conductivity, *Cylindrical bodies, *Axially symmetric flow, Fluid flow, Turbulent boundary layer.) (Velocity, Temperature, Energy, Measurement, Thermodynamics, Enthalpy.) (Model tests, Experimental data, Instrumentation.) Cooling.

A two-inch O.D. circular cylinder with porous walls fabricated out of a stainless steel woven wire mesh was aligned with its axis parallel to a low speed air stream. Secondary air was injected through the cylinder walls into the boundary layer at a uniform mass rate per unit area of outside cylinder surface in the range 0.00028 to .00290 of the free stream mass velocity. The boundary layer was turbulent. The heat transfer distribution along the cylinder was measured and is presented as a functional relationship between local Stanton number and Reynolds number with the injection rate as a parameter. Up to about one half reduction in heat transfer compared with zero injection resulted. A macroscopic energy balance at one injection rate was made on three portions of the model by appropriate boundary layer velocity and temperature surveys. Its results provided a satisfactory check on the heat transfer measurements. (Author)

AD-266 601 Div. 9, 30, 1
(TIPTA/LSK) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC EFFECTS OF SOME CONFIGURATION VARIABLES ON THE AEROELASTIC CHARACTERISTICS OF LIFTING SURFACES AT MACH NUMBERS FROM 0.7 TO 6.86,
by Perry W. Hanson. Nov 61, 51p. incl. illus. tables (NASA Technical note D-984)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-984.

DESCRIPTORS: (*Airfoils, Transonic airfoils, Supersonic airfoils, Wind tunnel models, Configuration, Aerodynamic configurations, Design, Elasticity, Aerodynamics, Subsonic flow, Transonic flow, Supersonic flow, Hypersonic flow, Stability, Flutter, Stresses, Load distribution, Model tests, Wind tunnels, Tests.)

Results are presented of tests on models having a range of airfoil thickness from 3 to 12 percent chord for single- and double-wedge airfoils and tapered planforms and from 9 to 20 percent chord for double-wedge airfoils and square planforms. The latter airfoils had leading- and trailing-edge radii of 0, 1, 3, and 6 percent chord. For the test parameters, in general, thickness effects are destabilizing at the higher Mach numbers but stabilizing at subsonic and transonic Mach numbers. Bluntness effects are stabilizing at supersonic speeds but are negligible at subsonic speeds. Double-wedge airfoils are more prone to flutter than single-wedge airfoils. Experimental results are compared with calculations using piston-theory aerodynamics.

AD-266 617 Div. 9
(TIPTP/JW) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
THREE-DIMENSIONAL VISCOUS WAKES,
by Martin H. Steiger and Martin H. Bloom. Oct 61, 9p. incl. illus. (PIBAL rept. no. 710)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-1580)
Unclassified report

DESCRIPTORS: (*Fluid flow, Wake, Viscosity.) (Fluid flow, Velocity.) *Fluid mechanics.

The velocity fields of three-dimensional viscous wakes are examined with the use of the boundary layer approximations, Oseen's linearization of the convective terms, and the assumption of constant fluid properties. Transform methods yield solutions for general types of initial conditions. As an illustration, the axial velocity distribution of a wake whose initial isovels (lines of constant velocity) are of elliptic shape and their decay to axial symmetry are demonstrated. (Author)

AD-266 620 Div. 9, 25
(TIPTP/MFA) OTS price $6.60

Pennsylvania State U., University Park.
SHOCK WAVE STRUCTURE IN A FULLY IONIZED GAS BASED ON MULTI-COMPONENT FLUID THEORY,
by Huon Li and Richard D. Mathieu. Sep 61, 44p. (Technical rept. no. 14)
(Contract AF 49(638)647, Proj. 9751)
(AFOSR-1618) Unclassified report

DESCRIPTORS: (Fluid flow, Theory, *Shock waves in *Gas ionization.) (Plasma physics, Continuum mechanics, Transport properties.) (Electromagnetic theory, Equations, Integration, Differential equations, Perturbation theory, Linear systems, *Magnetohydrodynamics.) *Bibliography.

The multi-component continuous approach for the investigation of the gasdynamics of a plasma is presented. More information about the flow properties of a plasma can be obtained than from the classical magnetohydrodynamic approach. Also, the resulting equations appear to be more easily solved than the Blotzmann equation of classical kinetic theory. The basic macroscopic conservation equations for a non-reacting multi-component plasma are presented. The fluid properties of each component are referred to the mean velocity of that component. Therefore, no limitations are placed on the magnitude of

the diffusion velocities. The effects of electric and magnetic fields are included. The equations for a two-component mixture are used to study the structure of a shock wave in a fully-ionized hydrogen gas. It is assumed that the momentum exchange and energy exchange between the ions and electrons are important because of the strong Coulomb forces present. (Author)

AD-266 636 Div. 9
(TIPTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON I, DYNAMICAL SIMILARITY AND II, INTRINSIC RELATIONS IN MAGNETOHYDRODYNAMICS,
by R. P. Kanwal. Sep 61, 10p. (MRC technical summary rept. no. 260)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Magnetic properties, Reynolds number, Mach number, Magnetic effects, Thermodynamics.) (Physical properties, Fluid flow, Viscosity, Velocity, Thermal conductivity, Pressure, Density, Electrical conductance, Equations, Motion.)

A discussion is presented on the constancy and similarities of dynamics such as: magnetic Reynolds number, magnetic Mach number, the ratio of the viscous and magnetic diffusivities, Hartman number and various combinations of these values. In addition, an analysis is made of some of the intrinsic equations of magnetogasdynamics.

AD-266 673 Div. 9, 1
(TIPTA/LSK) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
A BRIEF SUMMARY OF THE EFFECT OF PLAN FORM ON AUGMENTATION FOR GROUND EFFECT MACHINES WITH AN INTEGRATED SYSTEM FOR LIFT AND PROPULSIVE THRUST,
by Anibal Alfredo Tinajero. Aug 61, 22p. incl. illus. (AERO Rept. no. 1014)
Unclassified report

DESCRIPTORS: (Ground effect, *Flying platforms, Jets, Aerodynamic configurations, Model tests.) (Propulsion, Lift, Thrust, Jet propulsion.)

A brief summary of the effect of plan form on augmentation for ground-effect machines with an integrated system for lift and propulsive thrust is presented. In addition to the augmentation obtained from tests on different plan forms, the results include a comparison of the loss in augmentation with increase in propulsion for several plan forms. Results show that, with the proper choice of plan form, the propulsive thrust can be increased considerably, with only a slight loss in lifting capability. (Author)

AD-266 684 Div. 9, 25
(TIPTP/JW) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
THE POTENTIAL PROBLEM OF A SPHERE INSIDE A CIRCULAR CYLINDER,
by W. L. Haberman. Oct 61, 28p. incl. illus. tables (Rept. no. 1563)
Unclassified report

DESCRIPTORS: (*Compressible flow, *Gas flow, *Heat transfer, Spheres, Cylindrical bodies, Fluid flow.) (Mathematical analysis, *Partial differential equations.)

The potential problem of a sphere located at the center of an infinitely long circular cylinder is considered. Specific problems treated are: heat conduction with variable prescribed surface temperatures, convective heat transfer at the boundaries having variable temperatures, heat conduction with prescribed heat flux on the surface of sphere, and incompressible potential flow past the sphere inside a cylindrical duct. The solution for the velocity potential is used to determine the virtual mass of a sphere moving inside the cylindrical duct. (Author)

AD-266 685 Div. 9
(TIPTP/JW) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
FLOW ABOUT A SPHERE ROTATING IN A VISCOUS LIQUID INSIDE A COAXIALLY ROTATING CYLINDER,
by W. L. Haberman. Oct 61, 8p. incl. illus. table (Rept. no. 1578)
Unclassified report

DESCRIPTORS: (*Fluid flow, Liquids, Viscosity, Spheres, Cylindrical bodies, Velocity.) (*Fluid mechanics, Mathematical analysis, Boundary layer.)

The problem is considered of slow, viscous flow about a rotating sphere located at the center of an infinitely long circular cylinder which rotates at a different speed about the same axis as the sphere. The velocity distribution in the flow field and the couple required to maintain steady rotation are obtained. Results show the equivalence of this problem with that of potential flow past a sphere inside a cylindrical duct. A numerical example is worked out. (Author)

AD-266 701 Div. 9
(TIPTA/WAW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
WIND-TUNNEL INVESTIGATION OF PARAGLIDER MODELS AT SUPERSONIC SPEEDS,
by Robert T. Taylor. Nov 61, 16p. incl. illus. (NASA Technical note no. D-985)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-985.

DESCRIPTORS: (*Hypervelocity vehicles, Gliders, *Wings, Supersonic flow, *Supersonics, Aerodynamics, Model tests, Wind tunnel models, Wind tunnels.) (Lift, Drag, Measurement.)

An investigation was made in the Langley Unitary Plan wind tunnel to determine the behavior of paraglider models at moderate to high supersonic speeds. The models were deployed from a sting in the supersonic stream and steady-state aerodynamic performance data were obtained. Maximum values of the lift-drag ratio were about 1.4 at a Mach number of 2.65 and about 1.2 at a Mach number of 4.65. The angles of attack over which the models could be flown were limited by unsteady behavior of the canopy. (Author)

AD-266 702 Div. 9
(TIPTA/VGW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
CALCULATION OF FLOW FIELDS FROM BOW-WAVE PROFILES FOR THE DOWNSTREAM REGION OF BLUNT-NOSED CIRCULAR

CYLINDERS IN AXIAL HYPERSONIC FLIGHT,
by Alvin Seiff and Ellis E. Whiting. Nov 61, 14p. incl. illus. (NASA Technical note no. D-1147)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1147.

DESCRIPTORS: (*Blunt bodies, Bodies of revolution, Cylindrical bodies, Aerodynamics, Shock waves, Hypersonic flow, Gas flow, Wake, Mathematical analysis, Theory.)

A method by which known bow-wave profiles may be analyzed to give the flow fields around blunt-nosed cylinders in axial hypersonic flow is presented. The assumption is made that the pressure distribution curve in a transverse plane is similar to that given by blast-wave theory. Numerical analysis based on the one-dimensional energy and continuity equations then leads to distributions of all the flow variables in the cross section, for either a perfect or a real gas. The entire flow field need not be solved. Attention can be confined to any desired station. The critical question is the validity of the assumption. It is tested for a hemisphere cylinder in flight at 20,000 ft/sec. The flow is analyzed for three stations along the cylindrical afterbody, and compared closely with the results of an exact (inviscid) solution. The assumed form of the pressure distribution occurs at stations as close as 1.2 diameters to the body nose. However, it is suggested that the assumption may not apply this far forward in general, particularly when bodies of nonsmooth contour are considered. (Author)

AD-266 705 Div. 9
(TIPTA/WAW) OTS price $3.60

Therm, Inc., Ithaca, N. Y.
DUCTED PROPELLER AND RELATED AIRSCREW STUDIES AT TAR,
by A. Ritter and D. E. Ordway. Aug 61, 26p. illus. 39 refs. (Rept. no. TAR-TR 614)
(Contract Nonr-285900, Proj. NR 212-103)

Unclassified report

DESCRIPTORS: (*Aerial propellers, *Shrouded propellers, Mathematical analysis, Fourier analysis, Harmonic analysis, Special functions, Integral equations, Series.) (Wings, Aerial propellers, Lift by Downwash, Mathematical analysis.) *Aerodynamics.

A brief survey is presented of work performed at Therm Advanced Research on ducted propellers and of related airscrew studies. Efforts were made to point out the essential features in a descriptive fashion. (Author)

AD-266 787 Div. 9
(TIPTP/MFA) OTS price $3.60

Institute of Engineering Research, U. of Calif. Berkeley.
EXPERIMENTAL DETERMINATION OF PITCHING MOMENT AND DAMPING COEFFICIENTS OF A CONE IN LOW DENSITY, HYPERSONIC FLOW,
by Walter Leo Maas. 9 Oct 61, 25p. illus. (Rept. no. HE-150-190; Series no. 20, Issue no. 135)
(Contract Nonr-22245)

Unclassified report

DESCRIPTORS: (*Conical bodies, *Stability, Moments, Damping, *Hypersonic flow.) (Wind tunnels, Mach number, Hypersonic nozzles.) (Instrumentation, Electron counters, Photoelectric cells, Electromagnets.) (Experimental data, Equations, Motion.) (Errors, Analysis.) Theses.

Values of stability derivatives were determined experimentally for cones with semi-vertex angles of 45 degrees and 9 degrees. The results were compared with theoretical estimates and with other experimental data. The function of angle of attack was found to be positive, indicating negative damping. The influence of viscous effects upon these results is discussed. The experiment was conducted with freely oscillating models in hypersonic, low density flow, and was one of the first dynamic stability tests performed under these flow conditions. The instability is a marked deviation from the ordinary assumption of positive stability and certainly warrants further study and investigation. The cause of the instability remains undetermined; the effects of viscous flow and shedding of vortices is discussed in this connection. (Author)

AD-266 840 Div. 9, 30
(TIPTA/LSK) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
COLLECTION OF ZERO-LIFT DRAG DATA ON BODIES OF REVOLUTION FROM FREE-FLIGHT INVESTIGATIONS,
by William E. Stoney, Jr. 1961, 188p. incl. illus. tables (Technical rept. no. R-100, Supersedes Technical note TN 4201, dated Jan 58, AD-152 341)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note 4201.

DESCRIPTORS: (*Bodies of revolution, Aerodynamic configurations, Wind tunnel models, Fin stabilized ammunition, Guided missiles, Rockets with Fins, Aerodynamics, Drag, Supersonics, Transonics, Flight testing, Model tests, Tests.) (Data, *Aerodynamic data, Tables.)

A compilation is made of most of the zero-lift drag results obtained from free-flight measurements made by the Langley Pilotless Aircraft Research Division on fin-stabilized bodies of revolution. The data are arranged on standard forms, which also contain the significant geometrical factors. Supplementary data were provided to facilitate the determination of the body pressure drags from the measured total drags. Summary plots and discussions have been included to provide a unified and broad picture of the effects of body geometry on zero-lift drag. The Mach number range of the tests extends from 0.6 to approximately 2.0 and the Reynolds numbers based on body length from 2 to 100 x 10 to the 6th power. (Author)

AD-266 866 Div. 9, 16, 25
(TIPTB/CCH) OTS price $1.60

Defense Atomic Support Agency, Washington, D. C.
THE SOUND INTENSITY OF A SHOCK WAVE AS RELATED TO OVERPRESSURE.
Technical analysis rept.,
by Boyd A. Bakken. 23 Oct 61, 14p. incl. illus. table (Rept. no. DASA-540)

Unclassified report

DESCRIPTORS: (Intensity, *Shock waves, *Sound transmission, Hearing, *Auditory thresholds.) *Sound.

This report deals with the sound intensity of a blast wave and its noise level based on the threshold of human hearing. Since the sound level depends on ambient conditions, the effect of altitude was considered by determining the relative change between sea level and 5000 ft. Expressions for sound level as a function of overpressure are presented. (Author)

AD-266 922 Div. 9, 25
(TIPTP/MFA) OTS price $3.60

AVCO Research Lab., Everett, Mass.
NON-EQUILIBRIUM RADIATION FROM SHOCK HEATED NITROGEN AND A DETERMINATION OF THE RECOMBINATION RATE,
by R. A. Allen, J. C. Keck, and J. C. Camm.
June 61, 31p. incl. illus. table (Research rept. no. 110)
(Contracts AF 04(647)278 and DA 19-020-ORD-5476)
(AFBSD TR 61-20) Unclassified report

DESCRIPTORS: (*Recombination reactions, Spectrographic analysis, *Thermal radiation, *Shock waves, Shock tubes, *Nitrogen.) (Instrumentation, Photomultipliers, Oscilloscopes, Collimators.) (Relaxation time, Vibration, Excitation, Gas discharges, Radioactive decay.)

The radiation emitted by shock heated nitrogen is studied in the wavelength range 3300 to 7100 angstrom units at an equilibrium temperature from 6000 to 6800 K and densities from .01 to .20 atmospheres. The various radiating bands are identified by spectroscopic and photometric techniques. The radiation consists of bands from various nitrogen systems. The radiation overshoot observed at the shock front relaxes very rapidly to an equilibrium level. Comparison is made between the calculations and observations. It is concluded that one of the coupling schemes is a realistic approximation. The integral non-equilibrium radiation and the time of occurrence of peak radiation behind the shock front are also examined. (Author)

AD-266 943 Div. 9
(TIPTP/MFA) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE TURBULENT FAR-WAKE IN INCOMPRESSIBLE AXISYMMETRIC FLOW,
by A. W. Kenneth Metzner. 10 Nov 61, 21p.
(Rept. no. 312G-3)
(Contract AF 19(604)7400)
(ARPA Order no. 13-61)
Unclassified report

DESCRIPTORS: (*Axially symmetric flow, Compressible flow, *Turbulence, Wake, Blunt bodies, Gas flow, Hypersonics, *Continuum mechanics.) (Equations, Partial differential equations, Integration.)

The arguments that lead to the x to the 1/3 power dependence of wake width and the x to the -2/3 power dependence of axial velocity on axial distance in the far turbulent wake are reviewed. Assuming similarity of mean velocity profiles, the dominant terms in the Navier-Stokes equations for turbulent wake flow are used to derive these profiles with the help of Boussinesq's and Prandtl's hypotheses. The resulting profile has the same form as in the better known two-dimensional case. It is compared with an assumed Gaussian profile and both are compared with the Gaussian profile that results in the corresponding laminar case. The form of the eddy viscosity is also obtained in the two cases: for the former it is zero on the axis and rises to a maximum before falling to zero again on the wake boundary; whereas for a Gaussian profile it is constant across a cross section of the turbulent wake. In addition, the eddy viscosity has an x to the -1/3 power dependence in both cases, which is absent in the two-dimensional wake. (Author)

AD-267 036 Div. 9
(TIPTA/WAW) OTS price $3.00

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THEORETICAL AND EXPERIMENTAL STUDIES ON AIRLOADS RELATED TO HYPERSONIC AEROELASTIC PROBLEMS OF GENERAL SLENDER POINTED CONFIGURATIONS.
Rept. for Dec 59-Feb 61 on Dynamic Problems in Flight Vehicles,
by Garabed Zartarian and Pao Tan Hsu. Apr 61, 145p. incl. illus. 49 refs.
(Contract AF 33(616)5651, Proj. 1370)
(ASD TR 61-7) Unclassified report

DESCRIPTORS: (*Bodies of revolution, *Conical bodies, *Ogives, Aerodynamic configurations, Aerodynamics, Elasticity, *Hypersonics, Pressure, Lift, Drag, Load distribution, Model tests, Mathematical analysis, Differential equations, Integral equations.) (*Wings, *Flutter, Mathematical analysis.)

Two approximate techniques for estimating inviscid hypersonic airloads on pointed slender configurations, originally developed for airfoils and bodies of revolution are extended to cover other cross-sectional shapes. The first, an unsteady shock-expansion method, is illustrated by application to two ogives with nearly-elliptic, similar cross sections. As a check, steady-flow pressure and total lateral force were measured on two such models, one with a straight and the other with a cambered body axis, in the range of the hypersonic parameter 1.1 less than or equal to K less than or equal to 1.75. Experimental pressures are substantially higher than the predicted ones, although the shapes of the circumferential distributions are in good agreement. The second technique, a variational-Ritz procedure valid for lower values of the hypersonic parameter, is applied to a cone and an ogive, both with faired triangular cross sections, following a suitable transformation. Included is a preliminary investigation of the effects of aerodynamic nonlinearity, arising from large-amplitude oscillations, on the flutter characteristics of a typical wing section. (Author)

AD-267 069 Div. 9, 25
(TIPTP/TL) OTS price $3.60

Brown U., Providence, R. I.
THERMALLY DRIVEN NONLINEAR OSCILLATION IN A PIPE WITH TRAVELLING SHOCK WAVES,
by Boa-Teh Chy and S. J. Ying. Apr 61, 32p.
(Rept. no. AF 646/1)
(Contract AF 49(638)646, Proj. 9751)
(AFOSR-686) Unclassified report

DESCRIPTORS: (*Gases, Pipes, Gas flow.) (*Shock waves, Reflection, Combustion, Oscillation, Heaters, Frequency, Heat, Heat transfer, Pressure, Vibration.) Mathematical analysis.

Lin's method of characteristics perturbation was successfully applied to the calculation of a case of periodic nonlinear vibration of a column of gas in a pipe. The system consists of a heater located at the mid-section of a pipe closed at both ends. When the frequency of change in the heat-release rate is nearly equal to the natural frequency of the column of gas to one side of the heater, the fluctuation in pressure at the heater becomes almost in phase with the fluctuating change in heat-release rate. As a result, the amplitude of fluctuation in the pipe increases linearly with time until shock waves are formed in the system. Ultimately the level of fluctuation in the pipe attains a limiting value and the changes in the pipe become periodic. The results of this calculation of periodic nonlinear vibration agree with those of Betchov. (Phys. Fluid, I 205-212, 1958) The method used here opens the way toward solving many similar problems of nonlinear vibration by a straight-forward and systematic procedure. (Author)

10. FUELS AND COMBUSTION

AD-266 118 Div. 10, 26, 13
(TIPTM/EJH) OTS price $8.10

Rocketdyne, Canoga Park, Calif.
MECHANICAL SYSTEM DESIGN-CRITERIA MANUAL FOR PENTABORANE,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 80p. incl. illus. table (Rept. no. R-3133)
(Contract AF 33(616)6939)
(AF/SSD TR 61-3)
Unclassified report

DESCRIPTORS: (*Pentaboranes, *Liquid rocket propellants, Chemical properties, Physical properties, Toxicity, Hazards, Storage, Handling, Safety.) (*Fuel storage tanks, *Propellant tanks, Design, Materials, Handbooks.) (Metals, Alloys, Plastics, Rubber, Glass, Asbestos fiber.) (Pumps, Fuel filters, Pipes, Valves.) Welding.

Criteria for the design and fabrication of a pentaborane storage facility are presented. Primary consideration is given to the integrity of the storage system, and personnel safety. Properties of pentaborane affecting the selection, design, and fabrication of storage facilities are described and discussed. The selection of compatible materials of construction and control equipment are discussed. Procedures for testing, cleaning, and inspecting the storage system, or components thereof, are reported. The reactivation of existing facilities for use with pentaborane are also discussed. (Author)

AD-266 119 Div. 10, 26, 13
(TIPTM/EJH) OTS price $8.10

Rocketdyne, Canoga Park, Calif.
MECHANICAL SYSTEM DESIGN-CRITERIA MANUAL FOR CHLORINE TRIFLUORIDE,
by E. Suarez-Alfonso, A. E. Chambers and D. J. Hatz. Sep 61, 79p. incl. illus. (Rept. no. R-3132)
(Contract AF 33(616)6939)
(AF/SSD TR 61-4) Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Chlorine compounds, *Fluorides, Storage, Handling, Safety, Hazards, Toxicity, Chemical properties, Physical properties, Stability, Handbooks.) (*Fuel storage tanks, *Propellant tanks, Containers, Design, Materials.) (Metals, Alloys, Aluminum alloys, Stainless steels.) (Pipes, Valves, Fuel filters.) Tests.

Criteria for the design and fabrication of a chlorine trifluoride storage facility is presented. Primary consideration is given to the integrity of the storage system, and personnel safety. Properties of chlorine trifluoride affecting the selection, design, and fabrication of storage facilities are described and discussed. The selection of compatible materials of construction and control equipment are discussed. Procedures for testing, cleaning, and inspecting the storage system, or components thereof, are reported. The reactivation of existing facilities for use with chlorine trifluoride are also discussed. (Author)

AD-266 120 Div. 10
(TIPTM/EJH) OTS price $6.60

Rocketdyne, Canoga Park, Calif.
NITROGEN TETROXIDE HANDLING MANUAL,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 58p. incl. illus. table. (Rept. no. R-3135)
(Contract AF 33(616)6939)
(AF/SSD TR-61-8) Unclassiffed report

DESCRIPTORS: (*Liquid rocket propellants, *Rocket oxidizers, Nitrogen compounds, Tetroxides, Handling, Handbooks.) (Storage, Fuel storage tanks, Containers, Fuel systems, Materials, Preparation.) (Aluminum alloys, Stainless steel, Steel, Iron alloys, Nickel alloys, Chromium plating, Plastics, Lubricants.) (Hazards, Toxicity, Combustion, Detonation, Stability.) (Safety, Decontamination.) (Handling, Transportation, Fuel pumps, Gas generating systems.) Disposal, Physical properties, Chemical properties.

Directly usable information for the safe handling of nitrogen tetroxide is presented. The properties of the propellant and techniques for hazards reduction and control are discussed in detail. Selection and preparation of equipment for use with the propellant are presented and discussed. Propellant transfer procedures using both gas pressurization and pumping techniques are discussed in detail. Other pertinent information such as transportation, storage, and equipment decontamination are also presented. (Author)

AD-266 121 Div. 10
(TIPTM/EJH) OTS price $5.60

Rocketdyne, Canoga Park, Calif.
CHLORINE TRIFLUORIDE HANDLING MANUAL,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 49p. incl. illus. table. (Rept. no. R-3136)
(Contract AF 33(616)6939)
(AF/SSD TR 61-9) Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Rocket oxidizers, Chlorine compounds, Fluorides, Handling, *Handbooks.) (*Storage, Fuel storage tanks, Containers, Propellant tanks, Fuel systems, Materials, Preparation.) (Stainless steel, Steel, Copper, Nickel, Nickel alloys, Aluminum alloys, Iron alloys, Carbides,

Indium.) (Hazards, Toxicity, Combustion, Detonation.) (Safety, Decontamination.) (Handling, Transportation, Fuel pumps, Gas generating systems.) Disposal, Physical properties, Chemical properties.

Directly usable information for the safe handling of chlorine trifluoride is presented. The properties of the propellant and techniques for hazards reduction and control are discussed in detail. Selection and preparation of equipment for use with the propellant are presented and discussed. Propellant transfer procedures using both gas pressurization and pumping techniques are discussed in detail. Other pertinent information such as transportation, storage, and equipment decontamination are also presented. (Author)

AD-266 130 Div. 10, 26, 13
(TIPTM/EJH) OTS price $8.60

Rocketdyne, Canoga Park, Calif.
MECHANICAL SYSTEM DESIGN-CRITERIA MANUAL FOR NITROGEN TETROXIDE,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 83p. incl. illus. table. (Rept. no. R-3131)
(Contract AF 33(616)6939)
(AF/SSD TR 61-5) Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Nitrogen compounds, *Tetroxides, Storage, Handling, Safety, Hazards, Toxicity, Chemical properties, Physical properties, Stability, Handbooks.) (*Fuel storage tanks, *Propellant tanks, Containers, Design, Materials.) (Metals, Alloys, Plastics, Lubricants, Rubber, Elastomers.) (Pipes, Valves, Fuel filters, Pumps.) Welding, Tests.

Criteria for the design and fabrication of a nitrogen tetroxide storage facility are presented. Primary consideration is given to the integrity of the storage system, and personnel safety. The properties of nitrogen tetroxide affecting the selection, design, and fabrication of storage facilities are described and discussed. The selection of compatible materials of construction and control equipment are discussed. Procedures for testing, cleaning, and inspecting the storage system, or components thereof, are reported. In addition, the reactivation of existing facilities for use with nitrogen tetroxide are discussed. (Author)

AD-266 131 Div. 10
(TIPSM/EJH) OTS price $5.60

Rocketdyne, Canoga Park, Calif.
PENTABORANE HANDLING MANUAL,
by E. Suarez-Alfonso, A. E. Chambers and D. J. Hatz. Sep 61, 49p. incl. illus. table (Rept. no. R-3137)
(Contract AF 33(616)6939)
(AF/SSD TR 61-10) Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Rocket oxidizers, Handling, *Pentaboranes.) (*Storage, Fuel storage tanks, Containers, Propellant tanks, Materials, Preparation.) (Stainless steel, Aluminum alloys, Titanium alloys, Magnesium alloys, Nickel alloys, Brass, Copper, Glass, Carbon, Plastics, Lubricants.) (Hazards, Toxicity, Combustion, Stability.) (Safety, Decontamination.) (Handling, Transportation, Fuel pumps, Gas generating systems.) Disposal, Chemical properties, Physical properties, Rubber, *Handbooks.

Directly usable information for the safe handling of pentaborane is presented. The properties of the propellant and techniques for hazards reduction and control are discussed in detail. Selection and preparation of equipment for use with the propellant are also presented and discussed. Propellant transfer procedures using both gas pressurization and pumping techniques are discussed in detail. Other pertinent information such as transportation, storage, and equipment decontamination are also presented. (Author)

AD-266 144 Div. 10, 26, 13
(TIPTM/EJH) OTS price $8.10

Rocketdyne, Canoga Park, Calif.
MECHANICAL SYSTEM DESIGN-CRITERIA MANUAL FOR HYDRAZINE,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 79p. incl. illus. tables (Rept. no. R-3130)
(Contract AF 33(616)6939, Proj. 3148)
(AF/SSD TR 61-6) Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, *Hydrazines, Storage, Handling, Safety, Hazards, Toxicity, Chemical properties, Physical properties, Stability, Handbooks.) (*Propellant tanks, Containers, *Fuel storage tanks, Materials, Design.) (Metals, Alloys, Aluminum alloys, Steel, Plastics, Rubber, Graphite, Asbestos fiber.) (Pumps, Fuel filters, Valves, Pipes.) Tests, Welding.

This manual presents criteria for the design and fabrication of a hydrazine storage facility. Primary consideration is given to the integrity of the storage system, and personnel safety. Properties of hydrazine affecting the selection, design, and fabrication of storage facilities are described and discussed. The selection of compatible materials of construction and control equipment are discussed. Procedures for testing, cleaning, and inspecting the storage system, or components thereof, are reported. The reactivation of existing facilities for use with hydrazine is also discussed. (Author)

AD-266 145 Div. 10, 4
(TIPTM/EJH) OTS price $6.60

Rocketdyne, Canoga Park, Calif.
HYDRAZINE HANDLING MANUAL,
by E. Suarez-Alfonso, A. E. Chambers, and D. J. Hatz. Sep 61, 57p. incl. illus. table.
(Rept. no. R-3134)
(Contract AF 33(616)6939, Proj. 3148)
(AFSSD TR 61-7) Unclassified report

DESCRIPTORS: (Liquid rocket propellants, Rocket oxidizers, *Hydrazines, Handling, *Handbooks.) (Storage, Fuel storage tanks, Propellant tanks, Containers, Fuel systems, Materials, Preparation.) (Aluminum alloys, Stainless steel, Iron alloys, Nickel alloys, Titanium alloys, Plastics.) (Hazards, Toxicity, Combustion, Stability.) (Safety, Decontamination.) (Handling, Transportation, Fuel pumps, Gas generating systems.) Disposal, Physical properties, Chemical properties.

The manual presents directly usable information for the safe handling of hydrazine. The properties of the propellant and techniques for hazards reduction and control are discussed in detail. Selection and preparation of equipment for use with the propellant are also presented and discussed. Propellant transfer procedures using both gas pressurization and pumping techniques are discussed in detail. Other pertinent information such as transportation, storage, and equipment decontamination are also presented. (Author)

AD-266 245 Div. 10
(TIPTM/TCG) OTS price $2.60

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
FLAME PROPAGATION IN LIQUID-FUEL DROPLET ARRAYS WITH FORCED CONVECTION,
by K. Iinuma. Sep 61, 10p. illus. tables.
(Technical rept. no. 36)
(Contract DA 04-495-ORD-1634)
(AROD rept. no. 834:49)
Unclassified report

DESCRIPTORS: (*Liquids, *Fuel, *Octanes, Drops in Air with Pressure, Convection, Combustion, *Flame propagation, Velocity, Measurement, Theory, Schlieren photography.)

Flame propagation rates were measured in 1-dimensional arrays of liquid octane droplets burning in air with forced convection. A simple model based on the concept of immersion depth was used to predict flame propagation times. The calculated values, using constants determined from an experiment performed at the critical conditions for flame propagation, were found to agree fairly well with measured values. The average flame propagation time between fuel droplets was obtained with varying droplet spacings and flow velocities. The effect of flow velocity appeared to be relatively strongest for the largest spacings and the largest flow velocities opposite to the direction of flame propagation. Schlieren motion pictures showed that flame propagation involves an almost steady flame around the burning droplet, substantial evaporation and mixing with air during the steady-state burning period, and after an induction period, propagation of the flame to the adjacent droplet.

AD-266 362 Div. 10, 9, 25, 27
(TIPTM/GEC) OTS price $4.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TASK R.
Quarterly progress rept. no. 10, 1 July-30 Sep 61.
30 Sep 61, 28p. incl. illus. (Rept. no. TG 331-10)
(Contract NOrd-7386)
(ARPA Order no. 22-59, Task 5)
Unclassified report

DESCRIPTORS: (Rocket motors, *Solid rocket propellants, High temperature research, Gases, *Combustion chamber gases, Exhaust gases, Gas flow, Mixtures, *Heat transfer, Nitrogen, Carbon dioxide, Thermal conductivity.) (*Rocket motor nozzles, Solid rocket propellants, Gas flow, Temperature, Chemical reactions, Condensation reactions, Reaction kinetics, Recombination reactions.) (Boundary layer, Laminar boundary layer, Infrared spectroscopy, Thermodynamics, Test methods.) (*Flames, Combustion, Reaction kinetics.)

This report includes:
HIGH TEMPERATURE CHEMICAL KINETICS IN LAMINAR FLAMES.

THERMAL CONDUCTIVITY OF GASES.

ROCKET NOZZLE FLUID DYNAMICS.

ROCKET NOZZLE CHEMICAL KINETICS.

Research intended to provide some of the fundamental knowledge necessary for a rational understanding of the behavior of materials at high temperatures is summarized. Emphasis is on the flow and physical chemistry of high temperature gases that are characteristic of advanced solid propellant rocket motors, and the phenomena basic to heat transfer and cooling techniques in such environments, rather than in the properties of the materials themselves.

AD-266 388 Div. 10
(TIPTA/SEB) OTS price $2.60

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Progress rept. no. 4, July-Aug 61,
by R. M. Schirmer. Sep 61, 19p. incl. illus. tables (Research Div. rept. no. 2977-61R)
(Contract NOw 61-0590-d)
Unclassified report

DESCRIPTORS: (Gas turbines, Turbojet engines, *Jet engine fuels, Combustion, Combustion chamber gases, Flames, Thermal radiation, Luminescence, Tests.) (Temperature, Combustion chamber liners, Thermal radiation.) (*Hydrocarbons, *Polycyclic compounds, *Monocyclic compounds.)

Flame radiation was measured from gas turbine type combustion processes to indicate the effect of fuel composition. Comparisons of full-scale turbojet single combustor (P&W J-57 and GE J-79) data and a laboratory scale (2-inch) combustor data were made. The correlation between measurements of total flame radiant energy and combustor liner metal temperature was essentially a straight line. The relationship between flame radiation, or liner temperature, and Luminometer Number fuel ratings was studied. No significant reduction in flame radiation results from using fuels having Luminometer fuel ratings above 100. The effect of increased combustor operating pressure (to 15 atm.) on flame radiation, and an interpretation of the significance of Luminometer Number fuel ratings with high pressure combustion was also studied. The performance characteristics of Phillips 2-inch combustor has been shown to simulate that of the full-scale turbojet combustors satisfactorily for research studies of the burning quality of jet fuels. (Author)

AD-266 391 Div. 10, 4
(TIPTM/GEC) OTS price $2.50

Pennsalt Chemicals Corp., Philadelphia, Pa.
THE COMPATIBILITY OF MATERIALS WITH CHLORINE TRIFLUORIDE, PERCHLORYL FLUORIDE AND MIXTURES OF THESE.
Rept. for Nov 59-Feb 61,
by John C. Grigger and Henry C. Miller. Apr 61, 102p. incl. illus. tables.
(Contract AF 33(616)6796, Proj. 7312)
(WADD TR 61-54)
Unclassified report

DESCRIPTORS: (*Rocket oxidizers, Liquid rocket propellants, *Chlorine compounds, *Fluorides, *Perchloryl radicals, Mixtures, Handling, Storage, Containers, Propellant tanks, Materials.) (Corrosion, Alloys, Metals.) (Aluminum alloys, Copper alloys, Magnesium alloys, Nickel alloys, Titanium alloys, Steel, Stainless steel, Niobium, Molybdenum, Carbon, Graphite, Plastics, Polymers, Fluorides, Ethylenes.) (Tests, Grenades, Impact shock.)

Compatibility and corrosion rates of alloys of Al, Cu, Mg, Ni, Ti, steel and stainless steel, and Nb, Mo, C, graphite and fluorocarbon plastics

in ClF3, C103F and mixtures of these at 30 C were investigated. Ti, Nb, Mo, C and graphite were rapidly attacked in ClF3. Corrosion rates of others were extremely low in all liquids. In the vapors, instances of higher corrosion rates were noted. Ti exhibited increasing impact ignition in liquid C103F. No other metals showed impact ignition in ClF3 or C103F. In explosive shock tests, C103F gave a stronger interaction with the metals tested than did ClF3; Al showed a greater interaction with Fl chemicals than low C or stainless steel. Greatest enhancement of explosive shock occurred with Ti and C103F. A high order explosive interaction occurred between C103F and Ti cylinders perforated by a shaped explosive charge. (Author)

AD-266 445 Div. 10
(TIPTA/SEB) OTS price $6.60

Aerospace Corp., El Segundo, Calif.
OPTIMUM PROPELLANT LOADING AND PROPELLANT UTILIZATION SYSTEM TECHNIQUES (A TUTORIAL REPORT),
by David W. Whitcombe. 1 May 61, 66p. incl. tables (Rept. no. TDR-594(1114)TN-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Liquid rocket propellant, *Rocket oxidizers, Rocket fuels, Mixtures, Loading, Equations, Mathematical prediction, Mathematical analysis, Statistical analysis.) (Guided missiles, Surface to surface.)

The report derives optimum fuel or mixture ratio biasing techniques commonly employed in current ballistic missile programs. The missile stages can use conventional loading (e.g., Titan and Thor) or they can use propellant utilization (PU) systems (e.g., Atlas and Centaur). A description of the mechanization errors leading to unburned propellant (outage) is given for both cases. Formulae, derived in the report, allow the calculation of mean outage; the mean square outage; the outage variance; as well as the probability that the outage is less than some fixed value. The analysis applies directly to conventionally loaded ballistic missiles. It is assumed that the missile stage is loaded in accordance with a loading mixture ratio. A mixture ratio bias is calculated that will minimize the mean outage and the mean square outage and maximize the probability that the outage is less than some fixed value. An identification is obtained that extends the basic loading formulae to stages employing PU systems. Additional formulae are given that allow calculation of a fuel or oxidizer bias equivalent to the mixture ratio bias. (Author)

AD-266 457 Div. 10, 12
(TIPTA/SEB) OTS price $2.60

Bell Aerosystems Co., Buffalo, N. Y.
STORABLE PROPELLANT DATA FOR THE TITAN II PROGRAM.
Progress rept. 10 May-1 Sep 61,
by Ralph R. Liberto. Nov 61, 22p. incl. illus. tables (Bell rept. no. 8182-933002)
(Contract AF 04(694)72)
(AFBSD TR 61-35)
Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface *Liquid rocket propellants, *Rocket oxidizers, Contamination, Storage, Decomposition, Tests.) (*Nitrogen compounds, Tetroxides, Cleaning from Propellant tanks with Nitrogen.) (Nitrogen compounds, Tetroxides, Diffusion with Water.) (Metals, Graphite, Butyl rubber, Plastics.) (*Hydrazine, *Methyl hydrazine.) Rocket fuels.

Tests were conducted to determine the effects of the Titan II propellants on metals and non-metals and the effects of metals and contaminants on fuel decomposition. The Titan II propellants are N2O4 as the oxidizer and 50/50 blend of UDMH and N2H4 as the fuel. Storability data is presented for the fuel blend at 60 ± 5 F and at 200 F. Laboratory tests were conducted to determine the effectiveness of removing residual N2O4 and water by means of hot N purging. Also presented is information on the mixing or diffusing characteristics of water and N2O4. Laboratory tests were conducted with small quantities of water and large quantities of N2O4, in the order of a ratio of 1 to 10,000. (Author)

AD-266 629 Div. 10, 30
(TIPTW/JRG) OTS price $3.60

Rohm and Haas Co., Huntsville, Ala.
ENGINEERING RESEARCH.
Quarterly progress rept. 15 Mar-15 June 61,
by W. H. Groetzinger, III, C. H. Parr, and R. M. Sanders. 14 Nov 61, 37p. incl. illus. tables.
(Rept. no. P-61-11)
(Contract DA 01-021-ORD-11878)
Unclassified report

DESCRIPTORS: (Solid rocket propellants, Rocket motors, *Specific impulse, Measurement.) (*Solid rocket propellants, *Rocket motors, *Test equipment, Design.)

The measurement of the specific impulse delivered by small quantities of propellant in rocket motors of conventional but miniature design by means of a pendulum system was examined. The rocket motors were assumed to contain on the order of 10 g of propellant. Emphasis was placed on short pendulums for which the propellant burning time could not be neglected with respect to the pendulum period. A mathematical model of the pendulum was used for a design study. An error analysis was made which indicated that the total impulse delivered to the pendulum could be measured to within at least 1% s.d. Analysis of a prototype pendulum design indicated that performance should be satisfactory. A cost estimate of the system was made. (Author)

AD-266 689 Div. 10, 20
(TIPTA/SEB) OTS price $13.00

Aerojet-General Nucleonics, San Ramon, Calif.
HYDRAZINE PROCESS DEVELOPMENT.
Quarterly interim technical engineering progress rept. no. 2, Aug-Oct 61,
by J. H. Cusack, L. G. Carpenter and others.
Nov 61, 172p. incl. illus. tables, 47 refs.
(Contract AF 33(600)42996)
(ASD TR 7-840A, Vol. 3) Unclassified report

DESCRIPTORS: (*Hydrazines, Preparation, Processing, Production, Production reactors.) (Industrial production, Design.) (Gases, Solids, Liquids, Separation.) (Chemical reactions, Reaction kinetics, Test equipment.) (Uranium compounds, Dioxides, Nuclear energy, Fission products.) (Hydrogen, Nitrogen, Solubility in Ammonia.) (Chromatographic analysis, Nitrogen, Hydrogen, Oxygen, Krypton, Hydrazines.) Materials.

Descriptions are presented of the experimental facilities and equipment to determine solid-liquid and liquid-gas separation efficiencies, materials compatibility, and slurry flow properties. Techniques and equipment for kinetic yield measurement studies and for chemical energy

deposition analyses are described. The design of the in-reactor loop is presented. Initial hydroclone tests were made. An alternate production concept involving the use of a boiling reactor, to avoid anticipated fuel separation problems, is being studied. Gas-liquid separation at anticipated loop flow rates has been successfully accomplished. A literature survey of applicable materials compatibility data led to the design of a materials test program utilizing the toroid and materials testing loops. The in-reactor loop functional design is completed. A direct and an indirect method of fission fragment energy deposition measurement were designed. (Author)

AD-267 012 Div. 10
(TIPTA/SEB) OTS price $2.60

Aeronutronic, Newport Beach, Calif.
STUDY OF DETONATION BEHAVIOR OF SOLID PROPELLANTS.
Quarterly rept. no. 16,
by M. H. Boyer. 30 Nov 61, 23p. incl. illus. table (Publication no. U-1464)
(Contract NOrd-17945)
Unclassified report

DESCRIPTORS: (*Solid rocket propellants, Propellant grains, Combustion, *Detonation, Detonation waves, Pressure, Velocity, Heat, Volume, Theory, Mathematical analysis, Equations, Computers.)

Continued work is discussed on the problem of the solid to gas phase change in a detonation process and its effect on computational procedure. Examples of computed waves in TNT are presented. Treatment of double base type propellants is discussed. Reaction in such materials can be described by a model which is completely analogous to the grain burning model. (Author)

AD-267 070 Div. 10, 25
(TIPTP/TL) OTS price $3.60

Brown U., Providence, R. I.
ON THE STABILITY OF LAMINAR FLAME.
by Boa-Teh Chu and J. Y. Parlange. Sep 61, 30p. incl. table (Rept. no. AF 646/2)
(Contract AF 49(638)646, Proj. 9751)
(AFOSR-1593) Unclassified report

DESCRIPTORS: (*Flames, Stability, Combustion, Measurement, Conductivity.) (*Gases, Gas flow, Aerodynamics, Chemical reactions, Jet propulsion, Hydrodynamics, *Thermodynamics, Theory, Viscosity.) (Temperature, Density, Velocity, Energy.) (Acceleration, Enthalpy, Mach number.) Molecular structure, Partial differential equations.

The stability of a laminar flame subjected to a small perturbation is examined. A practical case is considered in which the amplitude of the disturbance, as measured by the flame displacement, is small in comparison with the wave length of the disturbance, but not necessarily small in comparison with the flame thickness. From the basic equations governing a reactive mixture and making use of an expansion procedure in the parameter l, defined as the ratio of the wave length to the flame thickness, the following results are obtained: (1) For l much less than 1, the phenomenological theory of Landau is justified. Accordingly, Landau's conclusion that a flame is unstable to small disturbances is strictly valid for disturbances of sufficiently long wave length. (2) The second term in the expansion in l/1 yields a correction to Landau's theory. Both the coefficient of thermal conduction and viscosity enter into the correction. The stabilizing influence of these additional terms is indicated. (Author)

AD-267 076 Div. 10, 4
(TIPTM/REB) OTS price $3.60

Callery Chemical Co., Pa.
PHYSICAL PROPERTIES OF LIQUID PENTABORANE. IV. VAPOR PRESSURE. V. THERMAL CONDUCTIVITY,
by C. F. Boynton, D. E. Terpko, and J. R. Ludwig.
Sep 61, 33p. incl. illus. tables.
(Contract NOa(s) 58-454-d)
Unclassified report

DESCRIPTORS: (Liquid rocket propellants, *Pentaboranes, Physical properties, Vapor pressure, Thermal conductivity.)

The vapor pressure of liquid pentaborane from 25 to 75 C is described by the equation: log P is equal to 5.6352-1384/(t +250), where P is the vapor pressure in psia, and t is the temperature in degrees C. From 75 to 125 C, the vapor pressure is described by the equation: low P is equal to 4.4803-730/(t +160). The thermal conductivity of liquid pentaborane from 70 to 105 F is described by the following equation: K is equal to 0.0874-(0.0000684 x t), where K is the thermal conductivity, BTU/hr-sq ft - (degrees F/ft), and t is the temperature, degrees F. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-266 425 Div. 11
(TIPTW/DLW) OTS price $6.60

Army Transportation Research Command, Fort Eustis, Va.
CONEX CONTAINER TRANSFER JACK.
Engineering rept.,
by Patrick H. Sea and Curtis J. Bronken.
Nov 61, 62p. incl. illus. tables. (TCREC Technical rept. no. 61-130)
Unclassified report

DESCRIPTORS: (*Fork lift vehicles, Dollies, Cargo vehicles, Cargo, Handling, Effectiveness, Design, Tests.) (Cargo ships, *Hydraulic jacks, Military requirements, Tests.)

The design and engineering testing is described of a CONEX container transfer jack. The jack is designed primarily for operation in the holds of cargo vessels; however, it can be used in other areas where CONEX containers are handled. Engineering tests of the jack included the determination of stability, power, maneuverability, strength, operator comfort, and safety. These tests showed that the jack meets the requirements of the technical and military characteristics and is suitable for service tests. (Author)

12. GUIDED MISSILES

AD-266 288 Div. 12
(TIPTA/WAW) OTS price $12.50

Radio Corp. of America, Camden, N. J.
STUDY OF INSTRUMENTATION AND TECHNIQUES FOR MONITORING VEHICLE AND EQUIPMENT ENVIRONMENTS AT HIGH ALTITUDE. VOLUME I. VEHICLES AND ENVIRONMENTS.
Rept. on Crew and Vehicle Environmental Data Sensing and Instrumentation,
by B. V. Wacholder and E. Fayer. 1961, 163p. incl. illus. tables, 133 refs.
(Contract AF 33(616)6407, Proj. 8223)
(WADC TN 59-307, vol. 1) Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Spaceships, *Hypervelocity vehicles, Lunar vehicles, Instrumentation, Hazards.) (*Space environmental conditions, Solar energy, Cosmic rays, Van Allen radiation belt, Aurorae, Albedo, Magnetic fields, Ionosphere, Meteorites, Solar corona, Solar atmosphere, Measurement.) (Upper atmosphere, Atmosphere, Gas ionization, Ozone, Pressure, Temperature, Measurement.) Atmosphere entry, Vibration, Aerodynamic heating, Drag, Re-entry aerodynamics.

Typical aerospace vehicles and their trajectories are described. The operating environments of these vehicles, in the region of space between the earth and the moon, are discussed. Those vehicles studied include the boost-glide vehicle, nearearth orbiting vehicles, extreme elliptical orbiting vehicles traversing the Van Allen radiation belts, transfer vehicles, and lunar vehicles. Each vehicle studied typifies some environmental problem, such as re-entry conditions or radiation effects. (Author)

AD-266 387 Div. 12
(TIPTW/JRG) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
DROP TESTS OF THE MODIFIED MK 8 CONTAINER FOR THE ROCKET MOTOR M46 (GAR 3A/4A).
Airmunitions test rept.,
by Paul P. Jennens. Oct 61, 17p. incl. illus.
(OOY TR 61-42)
Unclassified report

DESCRIPTORS: (Guided missiles, Air to air, *Rocket motors, *Containers, Packaging, Tests.) (*Propellants, Containers of Reliability.)

The purpose of this test was to determine if the modified Mk 8 Mod 0 shipping container could qualify as a suitable container for shipment of the M46 rocket motor (used in the GAR 3A/4A). The container was used previously to store bags of 16-in. gun propellant. The container was modified by cutting out a 13-in. section and welding it together. It was concluded that the container adequately fulfilled the requirements of physical rigidity and pressure retention. The container withstood damage and it protected the enclosed rocket motor from becoming unserviceable. It is recommended that the motors subjected to drops of 48-in. or less while enclosed in their shipping containers be determined serviceable. (Author)

AD-266 439 Div. 12, 25
(TIPTA/SEB) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
ENERGY CONVERSION INCLUDING MAGNETOAERODYNAMIC STUDIES AND THERMIONIC CONVERTERS. ELECTRICAL PROPULSION AND ELECTRICAL ENERGY CONVERSION INVESTIGATIONS.
Semi-annual technical rept., 1 Jan-30 June 61, by Wallis Grabowsky. 30 June 61, 18p. incl. illus. (Rept. no. TDR-594(1201-03)TR-1, pt. 1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Plasma physics, *Electric propulsion.) (*Plasma jets, Electrical properties, Electrical conductance, Measurement, Test methods.) (Propulsion, *Wire, Explosions, Test equipment, Design, Instrumentation.) (Generators, *Vortex generators, Design.) (Insulating materials, Oxides of Magnesium compounds, Thorium compounds, Hafnium compounds.) (Liquid metals, Lithium.) Tantalum.

Two possible methods of measuring arc jet plasma were investigated. The steady-state arc method leads to erroneous results due to deposits on the walls of the plasma container. The possibility of measuring the decay time of the plasma also was investigated. The method requires a switching on the order of 10 to the -10th power sec for a 1-mho/cm plasma. The exploded wire propulsion device was set up and instrumented. Closed-cycle magnetohydrodynamic vortex generator studies show that the specific power of the system will be much greater than that of a conventional turbogenerator for power levels on the order of 50 kw and greater. Possible containing and insulating materials, as well as working fluids, were investigated and feasible combinations obtained. Preliminary experiments were designed to evaluate the proposed configurations.

AD-266 443 Div. 12, 26
(TIPTW/EET) OTS price $8.10

Aerospace Corp., Los Angeles, Calif.
A SYSTEMATIC APPROACH TO HARDWARE MANAGEMENT,
by R. M. Curry and J. M. McGivern. 1 Apr 61, 82p. incl. illus. (Rept. no. TDR-594(1408)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Management engineering, Ground support equipment, Data processing systems, Computers, Design.) *Research program administration.

Project Champion is a management information system for the Minuteman weapon system and is primarily concerned with end items of hardware. It covers the identification, allocation, production and delivery of equipment, relating configuration control actions, specifications, and the master program plan on an integrated basis. Development of advanced analytical techniques, improved budgeting and costing techniques and simulated scheduling and financial exercises are planned. The recording and integration of data are accomplished on a high speed electronic computer. (Author)

AD-266 449 Div. 12, 30
(TIPTA/WAW) OTS price $12.50

Aerospace Corp., El Segundo, Calif.
DATA ACQUISITION, HANDLING, AND EVALUATION PLAN

FOR TRANSIT 3-B,
by James E. Calkins and J. S. Smith, Jr.
20 Jan 61, 1v. incl. illus. tables (Rept. no. TOR-594-(1102-01)-DTO-6)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Radio navigation, Satellite vehicle trajectories, *Launching, Radar tracking, Position finding, *Orbital flight paths, Space flight.) (*Telemetering data, *Data transmission systems, *Data processing systems.)

The plans and procedures to be used for the acquisition, transmission and analysis of launching, flight, and first pass data for Project TRANSIT 3-B are presented. The data thus accumulated is required for the evaluation of the TRANSIT 3-B flight test objective. (Author)

AD-266 513 Div. 12
(TIPTW/JRG) OTS price $5.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
PLANAR LIMIT MOTION OF NONSPINNING SYMMETRIC MISSILES ACTED ON BY CUBIC AERODYNAMIC MOMENTS,
by Charles H. Murphy and Betty A. Hodes.
June 61, 58p. incl. illus. tables (BRL memo. rept. no. 1358)
(DA Proj. 503-03-001)
Unclassified report

DESCRIPTORS: (*Guided missiles, *Aerodynamics, *Moments, *Motion, Perturbation theory, Mathematical analysis.) (Re-entry vehicles, Exterior ballistics.) Guided missile trajectories.

In Ballistic Research Laboratories rept. no. 1114 (AD-247 271) the nonlinear motion of symmetric missiles was analyzed by means of a perturbation technique. Owing to the algebraic complexity of this technique, it was only applied to the relatively simple problem of nearly circular motion. This report shows that the planar motion of nonspinning symmetric missiles possesses similar algebraic simplicity. The influence of various cubic static and damping moments is investigated in detail. Planar limit oscillations about a trim angle are found to exist under certain conditions. Finally, the analysis is combined with the almost circular motion analysis of BRL report no. 1114 to determine the basic features of the complete generalized amplitude plane. (Author)

AD-266 582 Div. 12
(TIPTW/RD) OTS price $1.60

Naval Postgraduate School, Monterey, Calif.
OPTIMUM INTERCEPTION OF A BALLISTIC MISSILE AT MODERATE RANGE,
by Frank D. Faulkner and Edward N. Ward. Jan 61, 16p. (Research paper no. 25)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Interception probabilities.) (*Guided missile trajectories, Mathematical analysis, Exterior ballistics.) (Numerical analysis of *Fuel consumption, Rocket motors.)

The problem of intercepting a ballistic missile optimally at moderate range is discussed. The problems of minimum time and minimum fuel consumption are specifically reported. A procedure is given for determining the trajectory on a digital computer, and some necessary and sufficient conditions are given for the corresponding optima. The computational procedure is a method of successive approximations. The simpler cases were checked out on the digital computer and further programming is under way. In the examples run, each iteration takes somewhat less than one second computing time on the CDC 1604. From three to six iterations are usually required to determine a trajectory, so that the trajectory is determined in five seconds or so. The variational equations, used to determine the trajectory, can also be used to determine the corrective thrust should the actual trajectory deviate slightly from the planned trajectory. (Author)

AD-266 591 Div. 12, 30
(TIPTA/LSK) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
GUIDANCE AND CONTROL DURING DIRECT-DESCENT PARABOLIC REENTRY,
by Edwin C. Foudriat and Rodney C. Wingrove.
Nov 61, 24p. incl. illus. 17 refs. (NASA Technical note no. D-979)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-979.

Presented at the NASA-Industry Apollo Technical Conference, Washington, D. C., July 18-20, 1961.

DESCRIPTORS: (Hypervelocity vehicles, *Reentry vehicles, *Atmosphere entry, *Re-entry aerodynamics, *Guidance, *Control, Lunar probes, Space flight, Orbital flight paths, Guided missile trajectories, Control systems, Analog computers, Linear systems, Automatic, Mathematical prediction, Computer logic, Flight simulators, Manned.)

Four guidance and control techniques applicable to the reentry from parabolic orbits of vehicles having low lift-drag ratios are described. Techniques include pilot and automatic control to a reference trajectory and the use of prediction to improve and simplify guidance procedures. Comparison between systems is made and areas where further study may be profitable are indicated.

AD-266 596 Div. 12, 8
(TIPTA/LSK) OTS price $2.60

Naval Research Lab., Washington, D. C.
SATELLITE TRACK COMPUTATION FOR DISPLAY PURPOSES.
Interim rept.,
by G. L. Hall. 3 Oct 61, 20p. incl. illus. tables (NRL Rept. no. 5652)
(Proj. no. ONR RF-007-01-41-4450)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Satellite vehicle trajectories, *Orbital flight paths, Tracking, Position finding, Earth, Mathematical analysis, Analytic geometry.) (*Display systems, Cathode ray tubes.) (Celestial mechanics, Pertubation theory, Astronomy.)

A proposal to design and construct a display of satellite orbital information and related data

introduced a need for a simple method of computing satellite position relative to the earth. A study of satellite orbital computation at NRL led to the development of a scheme with sufficient accuracy to make a useful display possible. The computation begins with the orbital elements. Next the satellite is located in polar coordinates on the orbital plane. These coordinates are then transformed to the earth latitude and longitude of the subsatellite point (defined here as the point on the earth's surface directly between the satellite and the center of the earth) and the height (distance) of the satellite above that point. The perturbing effects, rotation of perigee and precession of the nodes, are included in the computation. The results are expressed as geocentric earth longitude and latitude of the subsatellite point and the height above the earth's surface. Numerical examples show satellites can be located by such computational methods, with errors that are easily less than 0.5 degrees in longitude and of about 1 percent in height. (Author)

AD-266 630 Div. 12, 5
(TIPTA/LSK) OTS price $8.60

Rand Corp., Santa Monica, Calif.
AN ORBITAL CONTROL PROCESS FOR A 24-HOUR COMMUNICATION SATELLITE,
by F. T. Smith and J. H. Hutcheson. Oct 61, 91p. incl. illus. tables (Memo. no. RM-2809-NASA) (Contract NASr-21)
Unclassified report

DESCRIPTORS: (*Satellite vehicle trajectories, Orbital flight paths, Celestial mechanics.) (*Communication systems, Satellite vehicles, *Satellite rendezvous vehicles.) (*Satellite vehicles, Control systems, Guidance, Simulation.) (*Orbital flight paths, Errors, Thrust, Theory.) Mathematical analysis.

A description is given of a guidance or orbital control process particularly applicable for use with a 24-hour communication satellite. The process is based on fundamental principles of celestial mechanics, and places the main burden of error sensing and computation on ground stations. The first objective is to enable a satellite to rendezvous with a hypothetical reference satellite of point which is moving in a specified reference orbit, with a period of one sidereal day. When this objective is accomplished within tolerable errors, the system may be used as necessary to reduce errors arising from perturbations due to the gravitational accelerations of the sun, moon, and earth's bulge. The guidance process, the mathematical relationships involved, and some details of simulating its operation on a digital computer are discussed. The process itself depends on obtaining six or more independent observations, from one or more ground stations, of a satellite moving in some non-reference orbit as dictated by state-of-the-art injection cut-off errors. These observational quantities permit the calculation of orbital parameter errors (as compared to the reference orbit). It is then possible to drive errors nearly to zero by applying corrective thrust to the vehicle in accordance with mathematical relationship or guidance law. (Author)

AD-266 700 Div. 12
(TIPTA/SEB) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
ESTIMATES OF MINIMUM ENERGY REQUIREMENTS FOR RANGE-CONTROLLED RETURN OF A NONLIFTING SATELLITE FROM A CIRCULAR ORBIT,
by Charlie M. Jackson, Jr. Nov 61, 33p. incl. illus. (NASA Technical note no. D-980)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-980.

DESCRIPTORS: (Orbital flight paths, Satellite vehicle trajectories, *Satellite vehicles, Re-entry vehicles, Re-entry aerodynamics, Deceleration, Retro rockets, Rocket propulsion, Rocket propellants, Mathematical prediction, Mathematical analysis, Equations, Theory.)

Existing expressions are used to obtain the minimum propellant fraction required for return from a circular orbit as a function of vacuum trajectory range. Solutions for the parameters of the vacuum trajectory are matched to those of the atmospheric trajectory to obtain a complete return from orbit to earth. Results are restricted by assumptions of (1) impulsive velocity change, (2) nearly circular transfer trajectory, (3) spherical earth, atmosphere, and gravitational field, (4) exponential atmospheric density variation with attitude, and (5) a nonrotating atmosphere. Calculations are made to determine the effects of longitudinal and lateral range on required propellant fraction and reentry loading for a nonrotating earth and for several orbital altitudes. A comparison of the single- and two-impulse method of return is made and results indicate a trade off between propellant fraction required and landing-position accuracy. An example of a return mission from a polar orbit is discussed where the initial deorbit point is the intersection of the North Pole horizon with the satellite orbit. (Author)

AD-266 753 Div. 12
(TIPTA/SEB) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SEVENTEEN TIMES AROUND THE EARTH,
by Erno Nagy. 3 Nov 61, 9p. incl. illus. (Trans. no. FTD-TT-61-61 of Science and Technology, 5p., 28 Aug 61)
Unclassified report

DESCRIPTORS: (Space capsules, Satellite vehicle trajectories, Orbital flight paths, *Space flight *Satellite vehicles, Space navigation, Re-entry vehicles, Landing, Communication systems of USSR.) (Technological intelligence, Translations, Hungary.)

A report of Titov's space flight on Aug. 21, 1961, covers the aspects of guidance-navigation, landing, and communication systems.

AD-266 820 Div. 12, 26
(TIPTW/EET) OTS price $15.00

New Departure Div., General Motors Corp., Bristol, Conn.
DEVELOPMENT OF 10 TO THE 7TH POWER GYRO SPIN AXIS BEARINGS.
Final technical engineering rept. 19 Nov 58-19 Feb 61,
by J. T. Luxon, H. S. Kontrovitz and others. 15 Mar 61, 219p. incl. illus. tables. (Contract AF 33(600)38120) (ASD TR 61-7-700)
Unclassified report

DESCRIPTORS: (*Inertial guidance, Instrumentation, *Gyroscopes, *Ball bearings, Life expectancy, Design, Production, Manufacturing methods, Test facilities, Test equipment, Test methods, Tests.)

A program was initiated to assure the availability of 10 to the 7th power gyro spin axis bearings to meet the requirements of an inertial guidance system. This was to be accomplished by improving the bearing life and capability to reproduce. The program goals of 80% acceptability through a life of 5000 hours were achieved by an improvement in design details. Functional testing indicates that these bearings may operate successfully in the gyro. (Author)

AD-266 832 Div. 12, 9
(TIPTA/WAW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
DYNAMIC STABILITY AND CONTROL PROBLEMS OF PILOTED REENTRY FROM LUNAR MISSIONS,
by Martin T. Moul, Albert A. Schy, and James L. Williams. Nov 61, 20p. incl. illus. table. (NASA Technical note no. D-986)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-986.

DESCRIPTORS: (Spaceships, Lunar probes, Manned, *Re-entry vehicles, Stability, Control, Flight simulators.) (Conical bodies, Blunt bodies, *Atmosphere entry, Simulation.) *Re-entry aerodynamics, Damping, Roll.

A fixed-base simulator investigation was made of stability and control problems during piloted reentry from lunar missions. Reentries were made within constraints of acceleration and skipping, in which the pilot was given simulated navigation tasks of altitude and heading angle commands. Vehicles included a blunt-face, high-drag capsule, and a low-drag lifting cone. Each had a trim lift-drag ratio of 0.5. With the provision of three-axis automatic damping, both vehicles were easily controlled through reentry after a brief pilot-training period. With all dampers out, safe reentries could be made and both vehicles were rated satisfactory for emergency operation. In damper-failure conditions resulting in inadequate Dutch roll damping, the lifting-cone vehicle exhibited control problems due to excessive dihedral effect and oscillatory acceleration effects. (Author)

AD-266 833 Div. 12, 9
(TIPTA/WAW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STATIC LONGITUDINAL STABILITY OF A ROCKET VEHICLE HAVING A REAR-FACING STEP AHEAD OF THE STABILIZING FINS,
by Robert J. Keynton. Nov 61, 22p. incl. illus. tables, 10 refs. (NASA Technical note no. D-993)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-993.

DESCRIPTORS: (*Rockets, Aerodynamic configurations, *Supersonics, Aerodynamics, Model tests.) (Stability, Stability (Longitudinal), Pressure, Moments, Lift, Measurement.) (*Fins, Effectiveness.)

Tests were conducted at Mach numbers of 3.96 and 4.65 in the Langley Unitary Plan wind tunnel to determine the static longitudinal stability characteristics of a fin-stabilized rocket-vehicle configuration with a rearward facing step located upstream of the fins. Two fin sizes and planforms, a delta and a clipped delta, were tested. The angle of attack was varied from 6 to -6 degrees and the Reynolds number based on model length was about 10 times 10 to the 6th power. The configuration with the larger fins (clipped delta) had a center of pressure slightly rearward of and an initial normal-force-curve slope slightly higher than that of the configuration with the smaller fins (delta) as would be expected. Calculations of the stability parameters gave a slightly lower initial slope of the normal-force curve than measured data. The calculated center of pressure agreed well with the measured data. Measured and calculated increments in the initial slope of the normal-force curve and in the center of pressure, due to changing fins, were in excellent agreement indicating that separated flow downstream of the step did not influence flow over the fins. (Author)

AD-266 834 Div. 12, 9
(TIPTA/LSK) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
RADIATIVE HEAT TRANSFER DURING ATMOSPHERIC ENTRY AT PARABOLIC VELOCITY,
by Kenneth K. Yoshikawa and Bradford H. Wick. Nov 61, 17p. incl. illus. (NASA Technical note no. D-1074)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1074.

DESCRIPTORS: (*Hypervelocity vehicles, *Re-entry vehicles, Spaceships, Flight paths, Velocity, Re-entry aerodynamics, Aerodynamic heating, *Heat transfer, *Thermal radiation, Thermodynamics, Mathematical analysis, Theory.)

Stagnation point radiative heating rates for manned vehicles entering the earth's atmosphere at parabolic velocity are compared with corresponding laminar convective heating rates. The calculations were made for both nonlifting and lifting entry trajectories for vehicles of varying nose radius, weight-to-area ratio, and drag. It is concluded that radiative heating will be important for the entry conditions considered. (Author)

AD-266 859 Div. 12
(TIPTB/MS) OTS price $2.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
MOTION OF ARTIFICIAL SATELLITES: A BIBLIOGRAPHY OF PERIODICAL LITERATURE,
comp. by James S. Bethel. 30 Oct 61, 25p. 258 refs. (MEWD rept. no. 1103)
Unclassified report

DESCRIPTORS: (*Satellites, Motion, *Bibliography.)

Cited are 258 articles related to various aspects of artificial satellite mechanics. All were either written in English or translated into the language from Russian; they appeared in technical journals during the period 1946-1961. (Author)

Division 13 - INSTALLATIONS AND CONSTRUCTION

AD-266 924 Div. 12, 30, 9, 25
(TIPTW/RD) OTS price $1.60

AVCO Research Lab., Everett, Mass.
EFFECTS OF CARBON CONTAMINATION OF AIR ON ABLATION ARC WIND TUNNEL TEST RESULTS,
by S. Georgiev and P. H. Rose. Dec 59, 16p. incl. illus. (Research rept. no. 113)
(Contract AF 04(647)278)
Unclassified report

DESCRIPTORS: (*Hypersonic flow, *Simulation, *Hypersonic wind tunnels.) (Air, Contamination by Carbon.) (*Ablation, Materials, Thermodynamics, Enthalpy, Tests.) (Production of Gas ionization by Electric arcs.) Guided missile trajectories, Simulation, Plasma physics.

In an air arc, carbon contamination may (1) produce the exothermic reaction of carbon and oxygen increasing the gas enthalpy; (2) produce an oxygen starved gas; and (3) provide small solid particles in the gas flow. Analyses of how these effects apply to ablation measurements lead to the conclusions that (1) carbon contamination effects test results on combustible ablating materials only; (2) the magnitude of the contamination effect on ablation rate can be calculated when certain material and test conditions are known; (3) low enthalpy tests produce the most pronounced contamination effect; (4) for conditions where ablating material approach radiative equilibrium the effect of carbon contamination may not be negligible; and (5) in general, for ICBM re-entry conditions, the errors in calculating ablation rates due to the effect of contamination on test results are small (10-15%) and may be neglected. (Author)

AD-267 059 Div. 12, 9, 25
(TIPTA/WAW) OTS price $3.00

Boeing Airplane Co., Seattle, Wash.
COMPARISON OF RELATIVE COSTS OF THERMAL ANALYSIS METHODS FOR HYPERSONIC VEHICLE COMPARTMENTS,
by John R. Malcolm and Robert L. Slack. July 61, 187p. incl. illus. tables.
(Contract AF 33(616)6339, Proj. 9(15-6146))
(WADD TR 60-768) Unclassified report

DESCRIPTORS: (*Hypervelocity vehicles, *Re-entry vehicles, Cooling, *Heat transfer, Thermal conductivity, Aerodynamic heating, *Airconditioning equipment, Mathematical analysis, Test methods.) (*Mathematical analysis, *Test methods, Costs.) (Materials, Thermal conducitivity, Measurement, Costs.)

Results are presented of a study to examine the relationships between accuracy and cost in manhours, calendar time and dollars, in determing this transient heat flow for two hypothetical re-entry vehicles. Accuracy and cost information were obtained for analytical methods: hand calculations, digital computers, differential analyzers, and passive element analogues; and for experimental methods: various size panels, half and full size vehicles, and vehicle compartments. Results are presented as curves of accuracy as a function of cost. A general heat transfer digital computer program provided the most accuracy for the least cost. The other computing techniques rank in the following order: differential analyzer, passive element analogue, and hand calculations. The differential analyzer is the best method for parameter studies where a large number of runs is expected. (Author)

AD-267 062 Div. 12, 9, 25
(TIPTA/WAW) OTS price $2.25

American Machine and Foundry Co., Niles, Ill.
INSTANTANEOUS LOCAL TEMPERATURES OF AERODYNAMIC DECELERATORS. PART I. METHODS OF PREDICTING.
Rept. for July 59-Aug 60 on Fibrous Materials for Decelerators and Structures,
by G. Engholm, R. J. Baschiere, and R. A. Bambenek. Dec 60, 74p. incl. illus. tables, 32 refs.
(Contract AF 33(616)6673, Proj. 7320)
(WADD TR 60-670, pt. 1) Unclassified report

DESCRIPTORS: (*Re-entry vehicles, *Satellite vehicles, *Hypervelocity vehicles, Atmosphere entry, *Aerodynamic heating, Reduction, Deceleration.) (Parachutes, Blunt bodies, Bodies of revolution, Hemispherical shells, *Re-entry aerodynamics, Aerodynamics, Supersonics, *Hypersonics, Aerodynamic heating, Heat transfer, Temperature, Thermal radiation, Mathematical analysis, Differential equations, Integral equations, Mathematical prediction.) (Re-entry vehicles, Flight paths, Mathematical analysis.)

A numerical technique is presented for predicting temperatures developed in aerodynamic decelerators at high speeds. The predictions are obtained both by a simple method to estimate local equilibrium temperatures and by a more complex method to estimate instantaneous, local, temperature profiles. Sample calculations are included. A new numerical technique is described for predicting one dimensional thermal diffusion. It permits the use of larger time increments and therefore fewer calculations are necessary than with other numerical techniques. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-266 248 Div. 13, 25
(TIPTW/RD) OTS price $10.50

Stanford Research Inst., Menlo Park, Calif.
THEORETICAL STUDY OF GROUND MOTION INDUCED IN NONHOMOGENEOUS MEDIA BY NUCLEAR EXPLOSIONS, VOLUME II.
Final rept.,
by Y. D. S. Rajapaksee, L. W. Morland and others. 31 Dec 60, 140p. incl. illus. tables, 27 refs.
(Contract AF 29(601)1948, SRI proj. SU-2893)
(AFSWC TR 61-6, vol. 2)
Unclassified report

DESCRIPTORS: (*Nuclear explosions, Effectiveness.) (*Compression shock, *Wave transmission.) (*Plasticity, *Elasticity, Mathematical analysis, Integral transforms.) (*Underground structures of Air blast, Vulnerability.) (Soils, Stresses.)

A mathematical investigation is presented of an elastic, one-dimensional model of soil-structure interaction. Numerical examples are presented, which show that (1) the mathematical (and perhaps physical) behavior of the model differs depending on whether twice the transit time of the compression wave from the surface to the structures is greater or less than the effective overpressure duration; that (2) the mass and stiffness of the liner are of equal importance; and that (3) the infinitely stiff and zero stiffness (or mass) liners do not necessarily represent the extreme

conditions for dynamic displacement of the liner. The plane strain problem of a viscoelastic half-space subjected to surface loads moving with uniform velocity is treated; conditions are assumed steady with respect to the loads. Fourier transforms are applied to remove the time dependence, and analysis of the transform solution shows three different forms, depending on the load velocity magnitude in comparison with the two wave velocities associated with the elastic response of the material. Plastic wave propagation is reviewed. (Author)

AD-266 254 Div. 13, 20
(TIPTW/DLW) OTS price $6.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
A SUMMARY OF RECENT REPORTS PRODUCED UNDER AFSC PROJECT 1080: NUCLEAR WEAPONS EFFECTS ON HARDENED STRUCTURES,
comp. by John E. Scott. Sep 61, 62p. incl. illus. (Rept. no. AFSWC TN 61-26)
(Proj. 1080)

Unclassified report

DESCRIPTORS: (*Nuclear explosions, Blast, Shock waves, Stresses, Pressure, Military facilities, Construction, Structures, *Underground structures, *Reinforced concrete, Reinforcing materials, Shielding, Effectiveness.) Shock tubes, Test facilities, Pressure gages, Test equipment, Shelters, Hardening, Vulnerability, Analysis.

Abstracts or summaries are presented of all AFSWC technical reports, notes, and manuals published under project 1080, Nuclear Weapons Effects on Hardened Structures. (Author)

AD-266 579 Div. 13
(TIPTE/NTM) OTS price $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
ERECTION OF QUARTERS BUILDING FOR PIONEER POLAR CAMP,
by R. W. Hansen, C. R. Hoffman, and E. H. Moser. 26 Sep 61, 29p. incl. illus. tables (Rept. no. TN-422)

Unclassified report

DESCRIPTORS: (*Construction, *Buildings, Structures, Shelters, Housing, *Antarctic regions, *Arctic regions, Prefabricated buildings, Floors, Roofs, Electrical equipment, Heating plants, Furniture, Packaging, Foundations.)

The Pioneer Polar Camp 9/18-man living quarters includes: (1) a 16-ft wide by 48-ft long Jamesway hut fitted with a 2-ft high NCEL wall extension kit, for a 10-ft high building at the top of the arch; (2) curtains to divide the interior into 12 semi-separate spaces, nine of which are one- or two-man bedrooms, two are combination lounge-utility areas, and one is a utility area; (3) a single or double bunk in each bedroom and provisions for storing the personal gear of each occupant; (4) general lighting for the hallway, and individual lighting for each bedroom and the lounge areas; (5) a forced hot air heating system, with overhead circulating fans for the primary heating system, and space heaters for stand-by heating in the event of a power failure; (6) simple, rugged lounge furniture in the stand-by heater spaces at each end of the building; and (7) a urinal in the vestibule at one end of the building. (Author)

AD-266 759 Div. 13, 20
(TIPTE/CDM) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
OPERATIONAL EXPERIENCE FROM THE FIRST ATOMIC ELECTRIC POWER STATION (Opyt Raboty Pervoy Atomnoy Elektrostantsii),
by Yu. V. Yevdokimov, V. Ya. Kozlov and others. 25 Oct 61, 14p. incl. illus. tables (Trans. no. FTD-TT-61-151 of Atomnaya Energiya 11:12-18, July 61)

Unclassified report

DESCRIPTORS: (USSR, *Nuclear power plants, *Electric power production.) (Operation, *Boiling water reactors.) (Reactor safety systems, Reactor control, Hazards.) (USSR, Technological intelligence, Translations.)

Results of six years of uninterrupted operation of the first in the world atomic electric power station are described, and various operational conditions of the station and its parameters in these conditions are discussed. The operation of heat generating elements and the method of partial overloads was realized for the first time at the station and attained combustion of the fuel considerably higher than the planned value. Greater attention was devoted to experimental operations connected with the conversion of the station into boiling operation, operation in this condition and realization of nuclear overheating of steam in the reactor. A system of emergency localization is described. This system is intended for the prevention of ejection of vapor-gas mixture into the ventilation system and purification of gas ejected after trouble with a heat generating element. The system was created in connection with the presence of a greater number of experimental channels at the first atomic electric power station. (Author)

AD-266 895 Div. 13
(TIPTA/VGW) OTS price $1.00

Midwest Research Inst., Kansas City, Mo.
AUTOMATIC RUNWAY PROFILE MEASURING INSTRUMENTATION AND RUNWAY PROPERTIES. PART I. EQUIPMENT. Rept. for May 59-Apr 60 on Structural Design Criteria,
by D. F. Turner, R. S. Brown, and W. E. Snyder. Feb 61, 31p. incl. illus.
(Contract AF 33(616)6512, Proj. 1367)
(WADD TR 60-470, pt. 1)

Unclassified report

DESCRIPTORS: (Landing fields, *Runways, Configuration, Automatic, Measurement.) (*Collimators, Optical equipment, Recording systems, Data storage systems, Instrumentation, Sensitivity, Reliability, Tests.) (Collimators, Mobile, Trailers.)

An instrumentation system was developed which rapidly measures and records the elevation of the runway. Profile data are recorded in a form which can be used directly by existent data processing facilities at WADD. The system consists of two parts, the collimator which projects a highly collimated light beam down the runway, and a profilometer equipped with a photoelectric sensor. As the profilometer is towed, the sensor is held centered on the light beam by a servo system. A simple direct drive introduces the profile variations between the surface and the sensor position into a shaft-position-to-digital encoder. The output of the encoder is punched on paper tape. Accuracy and repeatability tests show that the profile instrumentation system is capable of accuracies which are well within runway data requirements. (Author)

AD-267 034 Div. 13
(TIPTE/CDM) OTS price $8.10

Texas Engineering Experiment Station, College Station.
PRESSURE DISTRIBUTION ON BUILDINGS.
Summary rept. no. 1, 15 June 54-31 Aug 56,
by Edwin S. Holdredge and Bob H. Reed.
31 Aug 56, 76p. illus. tables.
(Contracts DA 18-064-cml-2566, Proj. 4-11-05-008; DA 18-064-cml-35, Proj. 4-11-05-008 and DA 18-064-404-cml-77, Proj. 4-11-05-013)
Unclassified report

DESCRIPTORS: (*Buildings, Wind tunnel models, Model tests, *Wind, Gusts, *Pressure, Smokes, Load distribution.) (Gas flow, Tests, Mathematical analysis, (Tents, *Shelters, Underground structures, Structures.)

Investigations were conducted to determine air flow patterns and infiltration characteristics of military-type buildings by means of scale models. The following items were studied: (1) air flow patterns around model buildings at wind speeds ranging from approximately one to 20 mph, (2) amount of infiltration of particulate substances such as smokes into model buildings at wind speeds ranging from one to 20 mph, and (3) the minimum pressure required to prevent infiltration of particulate substances into the model buildings at wind speeds of approximately one to 20 mph and gusts up to approximately twenty mph. (Author)

AD-266 161 Div. 14, 8
(TIPTM/BRW) OTS price $2.60

Synthetic Mica Corp., Clifton, N. J.
DEVELOPMENT OF ULTRA HIGH TEMPERATURE DIELECTRIC MATERIALS FOR EMBEDDING AND ENCAPSULATING ELECTRONIC COMPONENTS.
Quarterly progress rept. no. 3, 17 Nov 60-16 Feb 61,
by F. A. Barr and J. P McCarthy. 16 Feb 61.
19p. incl. tables.
(Contract NObs-78714)
Unclassified report

DESCRIPTORS: (*Mica, Dielectrics, *Embedding substances, *Encapsulation, Electronic equipment.) (Aluminum compounds, Phosphates, Lead compounds, Borates, Glass, Binders.) (Porosity, Physical properties, Electrical properties, Dielectric properties.) (Processing, Pressure, Casting, Molding materials, Silicones, Synthetic rubber.)

The porosity of the standard aluminum phosphate - synthetic mica composition was decreased by forming by dry pressing. Water absorption values averaged as low as 12%. A dry pressed lead borate synthetic mica system exhibited average water absorption percentages as low as 8%. Additions of lead borate to a slurry of the regular phosphate bonded synthetic mica resulted in cast samples with a decrease in porosity of approximately 45%. No suitable methods of impregnating porous samples were developed. Both pressure and vacuum techniques produced samples difficult to cure. A study of phosphate bonded alumina indicated that such a system might be advantageous for incorporation into the basic formulation. (Author)

14. MATERIALS (NON-METALLIC)

AD-266 135 Div. 14
(TIPTM/GEC) OTS price $1.00

Rock Island Arsenal Lab., Ill.
ANTIOXIDANTS FOR GREASES - III,
by S. Fred Calhoun. 29 Aug 61, 32p. incl. illus. tables (Rept no. 61-3179)
Unclassified report

DESCRIPTORS: (Lubricants, *Greases, Additives, *Antioxidants.) (Salts, Carbamic acid.) (Salts, Amines, Phenyl radicals, Ethers.) (Salts, Methanes.) (Salts, Phenyl radicals, Amines.)

Forty-one compounds were evaluated as antioxidants, bringing the total number of compounds studied to 111. The summary of the complete investigation revealed that the metal salts of aryl substituted dithiocarbamic acid, diamino diphenyl ethers, aryl substituted methanes, and substituted phenylenediamines are outstanding antioxidants when considered as groups. Each group contains certain compounds which deviated from the general trend of the group and showed poor antioxidant ability. The hindered phenols and the primary and substituted amines and diamines were rather poor antioxidants as groups although a few individual compounds in each group did show outstanding ability. Attempts to correlate antioxidant ability to structural features were unsuccessful except in the general manner detailed above. Temperature continued to be a major factor in antioxidant ability as only 9 compounds or formulations gave protection for 500 or more hr at 250 F. (Author)

AD-266 204 Div. 14, 26
(TIPTM/EJH) OTS price $1.10

Vermont U., Burlington.
ON THE EFFICIENCY OF ADHESIVE JOINTS,
by John O. Outwater and David H. Kellogg.
15 Oct 61, 2p. incl. illus. (Technical memo. no. 175)
(Contract Nonr-321901, Proj. NRL 62 R05 19A)
Unclassified report

DESCRIPTORS: (*Resin adhesives, Plastic seals, Adhesives, Joints, *Bonded joints, *Metal joints, Aluminum, Stresses, Shear stresses, Failure (Mechanics).) Test methods.

The joint considered in this series of experiments was a lap joint in aluminum with an overlap of 1/2 inch. The adhesive used was Epon 826. There is a sharp peak in the strength value of Epon 826 lap joints when the adhesive thickness is 0.006 in. This optimum can be readily obtained by using a light sprinkling of glass beads of the same diameter on the wet adhesive before applying pressure to the joints. The beads will act as spacers and their effect in reducing the area or as stress raisers appears secondary. (Author)

AD-266 206 Div. 14, 25
(TIPTM/GEC) OTS price $1.60

Vermont U., Burlington.
THE SURFACE EFFECTS OF VARIOUS ENVIRONMENTS AND

OF THERMOSETTING RESINS ON GLASS,
by John O. Outwater and Oguzcan Ozaltin.
5 Oct 61, 41p. incl. illus. tables (Technical memo. no. 174)
(Contract Nonr-321901, Proj. NRL 62 R05 19A)
Unclassified report

DESCRIPTORS: (*Thermosetting resins, *Glass, Epoxy resins, *Surface properties, Tensile properties, Surface tension, Liquids.)

The effects of various environments and the effects of cured resin against glass strengthened by etching were studied and new insight into several of the mechanisms that occur at the resin-glass interface was obtained. None of a wide spectrum of liquids produced flaws on the surface and the curing of resins against the surface enhances the strength of the glass if there is a surface treatment on the glass. The effect of boiling water in reducing the strength of glass depends on the presence of resin on glass surfaces that are not surface treated. (Author)

AD-266 208 Div. 14, 26
(TIPTM/GEC) OTS price $2.60

Vermont U., Burlington.
THE NATURE, ORIGIN AND EFFECTS OF INTERNAL STRESSES IN REINFORCED PLASTIC LAMINATES,
by J. A. Matta and J. O. Outwater. 31 Oct 61, 12p. illus. (Technical memo. no. 176)
(Contract Nonr-321901, Proj. NRL 62 R05 19A)
Unclassified report

DESCRIPTORS: (*Plastics, *Glass, *Laminates, Resins, Physical properties, Stresses, Temperature, Polymerization, Tests, Measurement.)

When resin is cured in a rigid surround of glass, there is a tension set up between the resin and the glass. A simple experiment was devised to measure this tension and to note how it changes with time and temperature. It is found that it does not diminish with time and that it is linearly dependent on the highest temperature to which the resin has been brought during or after cure. NOL-type rings were made with the same resin systems and subjected to different cure temperatures so that we could examine the effect of the different shrinkage tensions on the physical properties of the laminates. The difference was minor even in regard to the environmental resistance of the laminate. (Author)

AD-266 277 Div. 14
(TIPTM/GEC) OTS price $1.60

General Electric Co., Philadelphia, Pa.
IMPROVEMENT OF REINFORCED PLASTICS.
Quarterly progress rept. no. 1, 1 July-30 Sep 61.
25 Oct 61, 13p. incl. illus.
(Contract NOw 61-0613-d)
Unclassified report

DESCRIPTORS: (*Plastics, Reinforcing materials, *Glass textiles, Fibers of Quartz, (Drawing (Machine processing), Tests, Mechanical properties, Electrical properties, Filament wound construction, Manufacturing methods.)

Development of hollow-glass and quartz-fiber reinforced plastic specimens, and the evaluation of their mechanical, thermal, and electrical properties was initiated. Investigation showed that (1) manufacture of small diameter E-glass hollow fibers is feasible; (2) simultaneous drawing of 35 E-glass fibers produces a uniform outside diameter but with variations in wall thickness; (3) E-glass, because of impurities, has a tendency to boil, quartz does not; (4) drawing of single, hollow filaments of quartz results in reasonably consistent geometrical dimensions. (Author)

AD-266 358 Div. 14, 30, 4
(TIPTM/EJH) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ANODIC FORMATION OF TITANIUM OXIDE DIELECTRIC FILMS.
Technical rept. on Chemistry and Plastics,
by R. T. Lamoureux. Sep 61, 14p. incl. illus. tables (Rept. no. 6-90-61-74)
Unclassified report

DESCRIPTORS: (Films, *Dielectric films on Titanium, Sheets, Thickness, Dielectric properties, *Electrostatic capacitance, Measurement.) (Test equipment, Electrical equipment, Oscillators, Capacitors, Resistors, Voltmeters.) (*Titanium compounds, Oxides, Electrochemistry, Manufacturing methods, Electrolytes, Temperature, Voltage, Electric currents.) Anodes, Surface properties.

An instrument was designed to measure the capacitance and dielectric loss of an anodic film during its formation. Results obtained on Ti are discussed. The instrument was designed to control the automatic production of capacitors; however, it has since become more useful as a tool in studying formation of anodic oxide films. The capacitance and loss of the oxide film are measured using the anode as one electrode and the electrolyte as the other. In this system, the capacity is inversely proportional to the dielectric film thickness. An indication of film quality is obtained at the same time by measuring loss tangent during the forming process. (Author)

AD-266 376 Div. 14, 4, 25
(TIPTM/EJH) OTS price $2.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
DIELECTRIC RELAXATION IN HYDROGEN-BONDED LIQUIDS,
by Matthew W. Sagal. Oct 61, 23p. incl. illus. tables, 32 refs. (Technical rept. no. 166)
(Contract Nonr-184110, Proj. NR-018-801)
Unclassified report

DESCRIPTORS: (*Dielectrics, *Relaxation time, Temperature, Measurement, Theory.) (*Liquids, Solutions, *Alcohols, *Ethanols, *Butanols, Glycols, Pentanols, Organic solvents, Cyclohexanes, Dielectric properties.) (Reaction kinetics, Dipole moments, Chemical bonds, Hydrogen, Molecular structure, Stereochemistry, Isomer, Hydroxides, Protons, Test equipment, Microwave spectroscopy.) Electric insulation.

The temperature dependence of the dielectric relaxation time was investigated from -5 to 50 C for ethanol-cyclohexane solutions from 1.0 to 0.25 mole fraction ethanol. The previously observed maximum in the relaxation time around equimolar composition is explained by a H-bonded switching mechanism. Measurements of dielectric relaxation from 5 to 50 C were carried out on 3 isomeric butanediols which differ in the separation of the two OH groups along the carbon skeleton. The differences in relaxation times among the 3 isomers can be explained by the switching mechanism suggested by the results for the ethanol-cyclohexane solutions. The dielectric relaxation times of n-butanol from 5 to 50 C were determined. The chain-length dependence of the dielectric relaxation time of the normal aliphatic alcohols is discussed in terms of the proposed mechanism. (Author)

AD-266 377 Div. 14, 4
(TIPTM/EJH) OTS price $7.60

New York U. Coll. of Engineering, N. Y.
RESINS BASED ON COMPLEX FORMATIONS WITH ORGANO-TITANATES.
Technical rept. no. 2, 1 June-31 Aug 61.
15 Sep 61, 69p. incl. illus. tables, 60 refs.
(Contract NOw 61-0433-d)
Unclassified report

DESCRIPTORS: (*Resins, Epoxy resins, Silicone resins, Heat resistant polymers, Metalorganic compounds, Alkyl radicals, *Titanates, Epoxides, Preparation, Chemical reactions, Polymerization, Copolymerization.) (Titanium compounds, Silicones, Polymers, *Metalorganic compounds, Complex compounds, *Bibliography.) (Titanium compounds, Zinc compounds, Oxides.) (Metals, Steel, Coatings, Plastic coatings, *Heat resistant paints, Plastic paints, Pigments, Aluminum, Gels, Tests.)

Titanate epoxy compounds were transformed into resinous materials. The work was concerned with various ways of controlling this process and maintaining the resulting resins in a state for desirable curing, desirable adhesion, and developing systems of plasticizing these resins. Some pigmentations are reported with Ti-based pigment systems, as well as with Al flakes. A co-resin formation was studied between the tetra isopropyl titanate-basic Zn octoate distillation compounds and a specific ethoxy silane (A-1100). Curing and plasticization were studied, followed by pigmentation, including pigmentation with an Al flake pigment. The influence of pre-gelling the resin compounds, followed by redispersion, was studied with respect to the adhesion and stability of the resin coatings. (Author)

AD-266 379 Div. 14
(TIPTM/EJH) OTS price $2.60

Narmco Industries, Inc., San Diego, Calif.
ESTABLISHMENT OF THE POTENTIAL OF FLAKE REINFORCED COMPOSITES AS ENGINEERING STRUCTURAL MATERIALS,
Quarterly progress rept. no. 3, 1 July-30 Aug 61, by C. Y. Chia, B. L. Duft and others. Oct 61, 21p. incl. illus. tables.
(Contract NOw 61-0305-c)
Unclassified report

DESCRIPTORS: (*Laminates, *Reinforcing materials, Molding materials, Plastics, Resins, Epoxy resins, Phenolic resins, Impregnation, *Glass, Mica, *Glass textiles.) (Test methods, Pressure, Stresses, Load distribution, Mechanical properties, Tensile properties.) (Screw threads, Cylindrical bodies, Manufacturing methods, Molding.) (Beams, Deformation, Theory.) (Rocket motor nozzles, Rocket cases, Filament wound construction, Materials.)

Composite materials studies indicated that combination of flake and fiber in a laminate will provide high compression, flexural, and tensile strengths. Increase in the modulus can be expected also. Additional studies provided data to substantiate the theory that flake laminates are insensitive to stress concentration. Techniques were evaluated for molding cylinders of glass flake material. Limited success was achieved which indicates that quality cylindrical flake laminates are possible. Studies on thread shear strength and machinability indicate that flake laminates could be used efficiently for inserts in primary structures. (Author)

AD-266 404 Div. 14, 1
(TIPTM/GEC) OTS price $3.60

Textile Research Inst., Princeton, N. J.
FLAME-RESISTANT PARACHUTE PACK MATERIAL.
Rept. for Mar 60-July 61 on Fibrous Materials for Decelerators and Structures,
by Robert F. Schwenker, Jr. and Robert K. Zuccarello. Oct 61, 33p. incl. illus. tables.
(Contract AF 33(616)7009, Proj. 7320)
(ASD TR 61-227)
Unclassified report

DESCRIPTORS: (*Parachutes, Packs, Materials, Refractory materials, High temperature research, Textiles, *Fire resistant textiles, Heat transfer, Cotton textiles, Processing, Thermal insulation, Heat resistant polymers, Bonding, Adhesion, Synthetic rubber, Additives, Resins.)

Investigation was made to obtain a flame-resistant parachute pack material that would offer effective thermal protection to the parachute canopy contained therein. Cotton duck fabrics were used as base materials and samples were subjected to (1) chemical modification and (2) resin treatments to improve fabric thermal characteristics. All treatments imparted excellent flame and glow resistance but did not significantly reduce heat transmission through the fabric. However, the combination of a flame- and glow-resistant cotton duck in an adhesive-bonded, two-ply construction resulted in fabrics of low heat transmission. These two-ply fabrics were found to have the high strength and abrasion resistance required for parachute pack material. Optimum flame- and glow-resistance and low heat transmission was achieved by combining THPC-resin-treated cotton duck (12.3 oz sq yd) with untreated cotton poplin (5.5 oz/sq yd) into a two-ply fabric using a flame-resistant neoprene formulation as an adhesive. Flammability and heat transmission tests indicated that this construction would protect a nylon parachute canopy from any heat damage for at least 10 sec even while the protecting fabric was attacked by flames having temperatures up to 1400 F. (Author)

AD-266 408 Div. 14, 27
(TIPTM/BRW) OTS price $9.10

National Carbon Corp., Cleveland, Ohio.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS.
Progress rept. for 1 May-15 Oct 60 on Refractory Inorganic Non-Metallic Materials.
Apr 61, 98p. incl. illus. tables.
(Contract AF 33(616)6915, Proj. nos. 7350, 7381, and 7-817)
(WADD TN 61-18) Unclassified report

DESCRIPTORS: (*Graphite, Processing, Coatings, Impregnation, Laminates, Fibers, Test methods, Quality control, Refractory materials.) (Physical properties, Density, Creep, Elasticity, Deformation, Electrical properties, Magnetic properties, Thermal conductivity, Thermal expansion, Crystal structure, Lattices, Light, Reflection, Polarization.) (Materials, Hydrocarbons, Pyrolysis, Deposits, Pressure, Temperature.) (Rocket motor nozzles, Tests.)

Results from activities to develop improved materials in the graphite and carbon field for missile and astronautics applications are reviewed. Progress is reported on new grades of graphite which extend the range of physical properties and on narrowing the spread of properties within a given grade. Preliminary data are included on numerous physical properties of the various graphite materials. (Author)

AD-266 485 Div. 14, 25, 30
(TIPTM/GEC) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
PHYSICAL METHODS FOR TESTING POLYMERS.
25 Oct 61, 2p. (AID rept. 61-148 of Thermomechanical Method of Investigation of Polymers. Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva 6:389-393, 1961)
Unclassified report

DESCRIPTORS: (*Polymers, Tests, Test equipment, Test methods, Solids, Mechanical properties, Physical properties, Thermodynamics, Deformation, Stresses, Heat, Phase transitions, Elasticity, Molecular weight, Stability, Transition temperature, Solvates, Adsorption, Vulcanization.) (USSR, Translations.)

A brief review is presented of the basic principle of the thermomechanical method for testing and investigating polymers and its scientific and industrial applications. The method is defined as a determination of the deformability of solid polymers in a wide temperature range under a given mechanical stress. Monoaxial compression is quoted as the stress most widely used in existing devices, like Kargin's balance with visual reading. Devices with automatic recording and devices in which a continuous stress is used under a constant rate of temperature increase are also noted. (Author)

AD-266 500 Div. 14, 26, 12
(TIPTM/GEC) OTS price $1.60

Goodyear Aircraft Corp., Akron, Ohio.
STRUCTURAL FABRIC PROGRAM.
Quarterly interim technical progress rept. no. 1, 1 July-1 Oct 61,
by J. T. Harris and J. O. Miller. Oct 61, 19p.
(Contract AF 33(600)43036, AMC Proj. 7-904)
(ASD TR 7-904(I))
Unclassified report

DESCRIPTORS: (*Metallic textiles, Textiles, Materials for Gliders, *Re-entry vehicles, Airframes, Re-entry aerodynamics, Machines, Design, Construction, Manufacturing methods, Production, Processing.) (Packaging, Volume.)

A program, as related to aerospace applications was initiated to provide a means of manufacturing large low-density AIRMAT structures made of metallic cloth and yarns capable of small volume packaging. This effort encompasses an industrial survey of loom manufacturers, a study of process variables and the selection of a textile consultant. Efforts were directed toward the development of a loom procurement specification and the actual procurement of a loom capable of producing a low density AIRMAT in the order of 10 to 20 ft wide with a maximum depth of 8 ft. (Author)

AD-266 510 Div. 14
(TIPTP/MFA) OTS price $7.60

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TESTS WITH RIGID WHEELS. TESTS IN FAT CLAY, 1958,
by Mary E. Smith. May 61, 35p. incl. illus. tables (Technical rept. no. 3-565, rept. no. 1)
Unclassified report

DESCRIPTORS: (*Vehicle wheels, *Tests, *Clays, Soils, Stresses, Statics, Load distribution, Deformation, Pressure.) (Experimental data, *Tables.)

The results of tests conducted to study the performance of a towed rigid wheel in a fairly soft clay are presented. The wheel was 48 in. in diameter and 6 in. wide. Five tests were conducted, each consisting of several passes of the wheel traveling at a speed of 1 fps over a test lane in which pressure cells were buried. The strength of the soil varied over a fairly narrow range. Measurements were made of deviation in static load, sinkage, motion resistance, contact pressure, stresses within the soil, and soil strength (cone index). The measured stresses were greater than the stresses computed by means of elastic theory by a factor ranging from about one to four. Nevertheless, measured stresses appeared reasonable. Although the program was limited in scope, the results were encouraging; and it is recommended that this type program be continued, using rigid wheels of various sizes in softer soils in the hope that generally applicable wheel-soil relations can be developed. (Author)

AD-266 562 Div. 14
(TIPTM/TCG) OTS price $1.60

Institute of Research, Lehigh U., Bethlehem, Pa.
BASIC FACTORS IN THE FORMATION AND STABILITY OF NON-SOAP LUBRICATING GREASES FOR USE AT ELEVATED TEMPERATURES.
Quarterly progress rept. no. 4, and Monthly rept. no. 17, 1 July-1 Oct 61,
by John J. Chessick, Albert C. Zettlemoyer and others. Oct 61, 13p. incl. tables.
(Contract AF 33(616)7120)
Unclassified report

DESCRIPTORS: (*Lubricants, *Greases without Soaps, High temperature research, Additives, Preparation, Stability, Tests.) (Carbon black or Graphite or Silicon compounds, Dioxides, *Lubricant additives and Ions of Inorganic substances, Polarization, Solids.) (Silver compounds or Cesium compounds or Thorium compounds, Chromates or Nitrates and Lead compounds, Iodides, Bromides.)

A program was developed to study C blacks for use as high-temperature grease thickeners. The Shell Roll Test stability at 650 F. was excellent for greases containing C blacks with a high volatile content dispersed in Plexol 201; stability decreased as volatile content decreased. Syneresis, water stability, and stability to mechanical working at room temperature were not profoundly influenced by surface concentration of oxygen complexes. Ion-incorporation of at least a monomolecular layer of low melting inorganic compounds into the surface of high free surface energy solids, particularly silicas, occurred. The treated solids are lowered in surface free energy, but not drastically in surface area, and possess profoundly improved properties for use as high temperature non-soap grease thickeners. The use of an inorganic liquid in evaluating thickener solid properties is discussed. Initially, ion-incorporated silicas were tested as to stability in boiling bromine. A HiSil X303-Cr203 silica appears unchanged by this treatment whereas profound changes in untreated HiSil were observed. (Author)

AD-266 565 Div. 14, 26
(TIPTB/LH) OTS price $11.50

Manchester Coll. of Science and Tech. (Gt. Brit.).
MECHANICAL BEHAVIOUR OF TWISTED YARNS. 1. FATIGUE BEHAVIOUR OF TWISTED CONTINUOUS FILAMENT YARNS. 2. GEOMETRIC STRUCTURE AND FORM OF YARNS.
Final technical rept. Oct 60-Oct 61,
by A. J. Booth, O. N. Bose, and J. W. S. Hearle.

Oct 61, 126p. incl. illus. tables.
(Contract DA 91-591-EUC-1467)
Unclassified report

DESCRIPTORS: (*Threads, Processing, Mechanical properties, Tensile properties, Fatigue (Mechanics), Test methods, Tests.)

Research was carried out into the behaviour of twisted continuous filament yarns as they are subjected to repeated cyclic stresses. A fatigue tester designed to give a constant extension stroke to a yarn mounted between two jaws was constructed and results of measurements of the slack developed are presented. The occurrence of filament breakage during the course of a test was found to be far more pronounced in the case of low twist yarns than in more heavily twisted yarns. Extension cycling and load cycling tests on the Instron tensile tester are included. Apparatus was constructed to investigate the recovery of yarns from a predetermined static strain and a few results are given. The design of a more versatile fatigue tester employing a larger number of yarn stations is under consideration and is discussed briefly. (Author)

AD-266 615 Div. 14, 26, 27
(TIPTM/GEC) OTS price $1.10

Rocketdyne, Canoga Park, Calif.
PREIMPREGNATED ROVING STUDY.
Monthly progress rept. no. 7, 30 Sep-31 Oct 61. 15 Nov 61, 4p. illus. table (Rept. no. 61RC16602)
(Contract NOw 61-0498-c)
Unclassified report

DESCRIPTORS: (*Rocket cases, *Propellant tanks, *Fibers, *Impregnation, *Filament wound construction, Processing.) (Storage, Laminates, *Resins, Mechanical properties, Tensile properties, Deterioration, Freezing, Wire-winding machines.) Synthetic fibers, Epoxy resins.

The aging study, investigating the effect of refrigerated and deep-freeze storage condition and the effect of various process parameters on preimpregnated roving, was continued. Experiments were begun for investigating the interaction of roving resin content, tension, and mandrel diameter on the migration of resin. (Author)

AD-266 703 Div. 14, 26, 30
(TIPTM/EJH) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
ELECTRON AND LIGHT MICROSCOPY TECHNIQUES SUITABLE FOR STUDYING FATIGUE DAMAGE IN A CRYSTALLIZED GLASS CERAMIC,
by Shelley Harrell and Erwin V. Zaretsky.
Nov 61, 16p. incl. illus. tables (NASA Technical note no. D-1161)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1161.

DESCRIPTORS: (*Bearings, Ball bearings, High temperature research, Materials, *Refractory materials, *Ceramic materials.) (*Glass, Crystals, *Fatigue (Mechanics), Stresses.) (Preparation, Abrasives, Dyes, Chemical milling.) (Surfaces, Simulation, Films, Silicon compounds, Monoxides.) (Test methods, Optical analysis, *Electron microscopy, *Microscopy.)

New techniques and methods making it possible to study the rolling-fatigue process in Pyroceram were developed. A method for locating, orienting, and identifying specific areas to be viewed by the electron microscope is outlined. A replication technique is described which makes use of preshadowed silicon monoxide replicas deposited after the application of a releasing agent. A vibratory polishing technique was found to produce surfaces free of all evidences of fire-polishing, even when examined by electron microscopy. A satisfactory stain was found that reduces the glare of reflected light when examining Pyroceram specimens with the light microscope. (Author)

AD-266 717 Div. 14
(TIPTM/TCG) OTS price $1.00

Massachusetts Inst. of Tech., Cambridge.
FRICTION AND WEAR AT ELEVATED TEMPERATURES.
Rept. on Surface and Interface Phenomena of Matter,
by Ernest Rabinowicz and Masaya Imai. May 61, 26p. incl. illus.
(Contract AF 33(616)5963, Proj. 7022)
(WADC TR 59-603, pt. 2) Unclassified report

DESCRIPTORS: (*Friction, Measurement, Materials, Metals, *Lubrication, Surface properties, Electrical properties, Resistance.) (Aluminum compounds, Zirconium compounds, Oxides, Nickel alloys, Graphite, Boron compounds, Carbides, *Surfaces.) (*Antiseize compounds, Lubricants, *Boron compounds, *Oxides.) High temperature research.

Friction experiments in the range of room temperature to 1800 F were conducted on A1203, Zr02, Hastelloy alloy N, graphite, and B carbide materials. The results fell into no particular pattern, but tests involving B carbide showed a sharp peak in the friction-temperature plot. This was traced to the influence of the B203 formed by oxidation. Wear and electric resistance measurements made on B203 lubricated surfaces indicated it may be a useful boundary lubricant at elevated temperatures.

AD-266 724 Div. 14
(TIPTM/TCG) OTS price $2.60

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
THE THEORETICAL BEHAVIOR OF KNITTED FABRIC SUBJECTED TO BIAXIAL STRESSES.
Rept. for Sep 59-Nov 60 on Fibrous Materials for Decelerators and Structures,
by Peter Popper. July 61, 23p. incl. illus.
(Proj. 7320)
(WADD TR 60-897) Unclassified report

DESCRIPTORS: (Materials, Threads, *Textiles, Structures, Stresses, Geometry, Mathematical analysis, Theory, *Mechanical properties.) Mathematical prediction, Deceleration, Pressure suits.

The theoretical mechanical behavior of a plain knitted fabric subjected to biaxial stresses is derived. An approximate mathematical model of the fabric structure was established from which the stress vs fabric-geometry and stress vs strain relationships were determined. The work was done by considering only the properties of the fabric structure, completely independent of the fiber properties. The results may be used for such applications as predicting the performance of a plain knitted fabric in situations where it will be stressed biaxially. (Author)

AD-266 735 Div. 14, 25
(TIPTM/TCG) OTS price $.75

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF SINTERABLE OXIDE POWDERS AND CERAMICS MADE FROM THEM.
Rept for 1 Jan-31 Dec 60 on Electrical and Electronic Materials,
by C. Hyde and W. H. Duckworth. June 61, 20p. incl. illus. tables.
(Contract AF 33(616)6238, Proj. 7371)
(WADD TR 61-262) Unclassified report

DESCRIPTORS: (Sintering, *Oxides, Powders, Production of *Ceramic materials.) (*Magnesium compounds, *Oxides, Effectiveness of Heating, Temperature, Time, Controlled atmospheres on Density, Crystallization, Phase transitions, Dilatometers, Measurement.) (*Refractory materials, Microstructure, Mechanical properties.)

A study was made of the strength of nonporous monophase ceramics as a function of their microstructure, and with the basic nature of sinterable powders. Sinterable powders provide a convenient way to study a wide variety of microstructural effects without introducing variations in density or purity. MgO powders, prepared by calcining a high-purity basic $MgCO_3$, were studied as representative examples. The temperature of calcination of the carbonate had a critical effect on the density in sintered compacts of the oxide. The density of compacts of each calcine increased during sintering until a ceiling density was reached after which grain growth occurred without further densification. Ceiling densities of 97 to 98% of theoretical were attained. Sintering in various atmospheres or for extended periods did not affect the attainable density, but sintering in a moisture-free atmosphere reduced the temperature at which the ceiling density was reached. Indications were that sintering atmosphere affected grain growth. The work demonstrated the importance of controlling processing variables to assure uniformly reproducible specimens for strength measurements. (Author)

AD-266 793 Div. 14, 4
(TIPTB/LH) OTS price $2.60

Institute of Polymz Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS.
Progress rept. no. 8, 1 Apr-30 June 61 and Final rept. 1 July 60-30 June 61,
by F. R. Eirich, P. G. Assarsson, and W. M. Lee. 30 June 61, 20p.
(Contract N140(138)67904B; Continuation of Contract N140(132)57745B)
Unclassified report

DESCRIPTORS: (*Nylon, *Fire resistant textiles, *Fire resistant coatings, Melting, Combustion, Inhibition.) (Vinyl radials, Acetates, Copolymerization with Acrylonitriles.)

The objective of this project was to establish feasible methods of improving the melt resistance and flame retarding properties of materials commonly used as textile fibers. Further investigations were carried out on the grafting of polyacrylonitrile (PAN) and its copolymers onto surfaces of nylon fabric; further an extensive series of experimentation was undertaken on the grafting and application of flame retardent coatings. (Author)

AD-266 830 Div. 14, 26
(TIPTE/NTM) OTS price $2.60

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 8, 1-31 Oct 61, by B. Duft, C. E. Thompson and others. Oct 61, 25p. incl. illus. tables.
(Contract NOw 61-0623-c)
Unclassified report

DESCRIPTORS: (*Beams, *Reinforcing materials, Resins, Plastics, *Laminates, Fibers, Filaments, *Glass textiles, Coatings, *Filament wound construction, Photoelasticity, Elasticity.) (Theory, Tensile properties, Deformation, Mathematical analysis, Equations, Moments, Shear stresses, Stresses.)

Research was continued on the potential of filament wound composites. Difference in principal stresses were determined photoelastically for composites reinforced with broken fibers. Glass rod reinforced composites, cured at room temperature, and .010 in. diameter glass fiber reinforced specimens cured at 200 F, were evaluated in tension. The failure in the .010 in. diameter glass fiber reinforced specimen was observed at a distance of 10D to 40D from the gap. The failure of the glass rod reinforced specimen occurred as expected at the point of discontinuity. Effects of coatings on fiber strength were investigated. Preliminary data indicates coatings to be advantageous for the preservation of E-glass strength. (Author)

AD-266 850 Div. 14, 25
(TIPTM/TCG) OTS price $2.60

Watervliet Arsenal, N. Y.
EFFECT OF POISSON'S RATIO OF AN ELASTIC FILLER ON FORCE TRANSFER BETWEEN EMBEDDED MICROFIBERS,
by M. A. Sadowsky and Y. Weitsman. Sep 61, 31p. incl. illus. tables (Technical rept. no. WVT RR 6108 R)
(DA Proj. no. 59901004)
Unclassified report

DESCRIPTORS: (Materials, *Fibers, *Stresses, Shear stresses, Mathematical analysis, Theory, Elasticity.) Embedding substances.

The nature of the stress field which develops in a composite material formed of microfibers embedded in a filler substance was investigated. A mathematical analysis is carried out for a representative layer of filler substance contained between two rows of microfibers. The case is considered when one row consists of an infinitely long microfiber, while the second row is composed of two semi-finite microfibers. An exact solution, based on the two-dimensional theory of elasticity, is obtained for the stress field which is activated by giving the two semi-infinite microflakes a tangential displacement of separation. An unexpected peculiar influence of Poisson's ratio of the filler is found which leads to a practical recommendation to avoid fillers with a high value of Poisson's ratio. (Author)

AD-266 881 Div. 14
(TIPTM/TCG) OTS price $4.00

Manufacturing Labs., Inc., Cambridge, Mass.
SUBSTRUCTURE AND MECHANICAL PROPERTIES OF REFRACTORY METALS.
Rept. for 1 Nov 59-31 Mar 61 on Metallic Materials,
by B. S. Lement, D. A. Thomas and others.

Aug 61, 255p. incl. illus. tables, 83 refs.
(Contract AF 33(616)6838, Proj. 7351)
(WADD TR 61-181) Unclassified report

DESCRIPTORS: (*Refractory materials, Structures, Tungsten wire, Sheets, Molybdenum wire, Tantalum, Niobium, Foils.) (Mechanical properties, Tensile properties, Crystallization, Microstructure, Crystal structure, Lattices, Deformation, Hardness, Heat treatment, Phase studies, Stresses, Rupture, Plasticity, Vacuum systems, Shear stresses.) Ceramic materials, Electron microscopy, X-ray diffraction analysis.

Quantitative results on the substructural characteristics of W, Mo, Ta and Co are being obtained through the coordinated programs of the five laboratories. Changes in subboundary spacing of worked materials were measured microscopically as a function of annealing temperature, and corresponding changes in particle size and lattice strain were obtained by Fourier analyses of diffraction-line shapes. Combined application of x-ray reflection microscopy, double-crystal diffractometry, and transmission electron microscopy to single-crystal and polycrystalline W revealed various orders of substructure in terms of size, disorientation, and dislocation arrays; and progressive alterations were traced through the stages of recovery and recrystallization. Stacking faults and twins have been found in W and Co after high-temperature annealing. The complex interfolding of the distorted grains and the formation of deformation bands produce an unexpectedly large number of boundary intercepts per unit of transverse distance. (Author)

AD-266 884 Div. 14, 8
(TIPTM/TCG) OTS price $3.60

Motorola, Inc., Chicago, Ill.
CONFORMAL COATINGS FOR PRINTED CIRCUIT ASSEMBLIES.
Quarterly rept. no. 1, 10 July-31 Oct 61,
by Anthony J. Beccasio. 31 Oct 61, 18p. illus.
(Contract DA 36-039-sc-89136, Proj. 5999-004)
Unclassified report

DESCRIPTORS: (*Printed circuits, *Coatings, *Epoxy resins, Silicone resins, Phenolic resins, Amines, Triazines, Polymers, Urethanes, *Resins on Glass, Paper, Copper, Laminates.) (Heating, Temperature, Scheduling, Physical properties, Electrical properties, Adhesion, Corrosion, Dielectric properties, Surfaces, Soldering.) Plastic coatings.

Commercially available epoxy and polyurethane resin conformal coatings were evaluated as protective coatings on glass-epoxy and paper-epoxy Cu-clad laminate printed circuit boards. All the epoxy and polyurethane coatings tested met the following characteristics: (1) suitability for dip, spray on brush coat application, (2) transparency when full cured, (3) cured within 2 hr at 75 C, (4) did not support fungus, and (5) one component system preferred. No blistering, wrinkling, cracking or corrosion was observed; good adhesion to test panels was obtained. The dielectric constant decreased with increasing frequency from 1 to 100 mc. The Q factor of the epoxy coated boards decreased as compared to the uncoated boards. All coated specimens passed the initial dielectric withstanding voltage test before thermal cycling.

AD-266 889 Div. 14, 25, 4
(TIPTM/GEC) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
RESEARCH ON PHASE EQUILIBRIA BETWEEN BORON OXIDES AND REFRACTORY OXIDES INCLUDING SILICON AND ALUMINUM OXIDES.
Quarterly progress rept. no. 9, 1 July-30 Sep 61,
by P. J. Gielisse and W. R. Foster. 18 Oct 61, 10p. incl. illus. tables (Rept. no. 931-9)
(Contract AF 33(616)6509, Proj. 7021)
Unclassified report

DESCRIPTORS: (*Refractory materials, *Oxides, *Boron compounds, *Aluminum compounds, *Silicon compounds, *Phase studies, Thermodynamics, Phase transitions.) (Liquids, Solids, Crystals, Theory, X-ray diffraction analysis, Microscopy.)

Phase relationships of the ternary system A1203-B203-S102 were determined by a modified quenching technique and solid-state sintering reactions. No ternary compounds were detected in the B203-rich portion. Relations near the S102-B203; side are in part derived from tentative results obtained in independent studies. Attempts to synthesize sillimanite (A1203.S102) with the aid of B203 flux yielded results which cast doubt on the success claimed for such synthesis. (Author)

AD-266 890 Div. 14, 12, 25
(TIPTM/GEC) OTS price $7.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE DESIGN OF PAINT COATINGS FOR SPACECRAFT,
by L. Whitby. June 60, 1v. incl. illus. tables, 94 refs. (Rept. no. LMSD-703026)
(Contract AF 04(647)347)
Unclassified report

DESCRIPTORS: (*Coatings, *Paints, Design, Spaceships, *Satellite vehicles, Temperature control, Space environmental conditions, High temperature research.) (*Organic coatings, Silicones, Resins, Titanium compounds, Silicon compounds, Estess.) (Refractory coatings, Phosphates of Zinc compounds, Aluminum.) (Coatings of Oxides, Anodes, Films.) (Pigments, Absorption of Infrared radiation, Scattering, Optics, Photo emission.) (Optics, Reflection, Absorption.)

Coatings for spacecraft must be designed to withstand vacuum, corpuscular, and electromagnetic radiation, hypersonic particulate bombardment of intensities not yet defined, and wide temperature extremes. They must also possess optical properties such that they can produce, or assist in producing, dissipation, or etention, of internally-generated heat, together with suppression or encouragement of heat inflow from the external solar radiation, and so assist in maintaining temperature control of the payload. This report surveys the requirements of paint coatings in withstanding space environments and in providing some measure of passive temperature control in spacecraft by radiation balance. Paint vehicles, pigments, and complete paint systems are discussed. Attention is paid to the potentialities of unconventional inorganic and quasi-organic paint vehicles which would be of promise in gaining a degree of stability against high temperatures and vacuum which is lacking with conventional organic vehicles. (Author)

AD-266 928 Div. 14, 29, 1
(TIPTB/CCH) OTS price $3.60

Naval Supply Research and Development Facility, Bayonne, N. J.
THERMAL PROTECTIVE CLOTHING FOR STRATO-LAB HIGH

#5,
by J. J. Anderson. Nov 61, 30p. incl. illus.
29 refs. (Informal technical rept. no. 22-11/61)
Unclassified report

DESCRIPTORS: (Protective clothing of *Insulating materials for *Pressure suits, Thermal insulation.) (Solar energy, Thermal radiation, Infrared radiation, Resistance, Reduction, Convection.)

An insulating garment to be worn in conjunction with the Mercury-type Navy Mark IV Full Pressure Suit was required for use by Navy Balloonists for a flight to a projected altitude of 120,000 feet. An insulation garment was designed utilizing a vacuum deposited aluminum far infrared reflective insulation system of fabrics. The insulation consisted of a four layer sandwich structure intended to reflect the intense solar heat and also reduce heat loss by conduction, convection, and radiation thereby tending to isolate the balloonist from the thermal environment. The garment was designed to provide low weight insulation, good mobility and ease of removal in case of an emergency. The suits were worn during the STRATO-LAB High #5 flight and contributed to the successful accomplishment of the mission. (Author)

AD-266 935 Div. 14, 27, 12
(TIPTM/TCL) OTS price $1.10

Bendix Products Div., Bendix Corp., South Bend, Ind.
SERVICES TO GENERATE BASIC ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS.
Monthly progress rept. no. 8, 1-31 Oct 61,
by F. P. Weldy. 15 Nov 61, 2p. illus table.
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: (*Plastics, Structures, *Rocket cases, *Filament wound construction, Adhesive tapes, Failure (Mechanics), Rupture, Stresses, Hydrostatic pressure, Tests.)

A study was conducted to ascertain if there was a correlation between the filament stress of rocket cases and the filament stresses of their respective D rings. The purpose was to determine if the cases tended towards sensing the maximum, mean, or minimum tape strengths as determined by D ring tests. The data was arranged in two groups; one for cases which failed in the circumferential windings and another group for failures in longitudinal windings. A regression and correlation analysis was conducted to study the relationship of D ring filament strength to case filament strength. The highest degree of correlation was obstined for the minimum tape strengths, for both longitudinal and circumferential failures. This was interpreted to mean that the minimum tape strength has a greater influence on the ultimate vessel strength than the maximum or mean tape strenths. This conclusion is additionally supported since the correlation was the highest for the minimum tape strength for both circumferential and longitudinal failures. (Author)

AD-266 953 Div. 14, 10
(TIPTM/EJH) OTS price $3.60

Material Lab., New York Naval Shipyard, Brooklyn.
THERMAL RADIATION DAMAGE TO CLOTHS AS A FUNCTION OF TIME OF EXPOSURE, RECTANGULAR PULSES.
Final rept.,
by John J. Bates, and T. I. Monahan. 16 June 55,
16p. illus. tables (Lab. proj. 5046-3, pt. 74)
Unclassified report

DESCRIPTORS: (*Cotton textiles, *Woolen textiles, Textiles, Radiation effects, Radiation damage, *Thermal radiation, Intensity, Time.) (Textiles, Moisture, Thermal conductivity, Thermal diffusion, Pyrolysis.) (Test methods, Test equipment, Carbon arc lamps.) (Mathematical analysis, Theory.)

The total energy (radiant exposure) required to produce a given level of damage in a material is dependent on the time during which the material is irradiated and the rate at which the energy is applied (irradiance). The purpose of this study was to determine the nature of this relationship for cloths. Several cotton and wool cloths were exposed to the 3 carbon-arc sources. Results indicate that reciprocity holds for rectangular pulses of intense thermal radiation applied to the cloths, for char-through and for complete destruction, only for exposure times equal to or less than 1 second. For threshold damage for these times and for all 3 levels of damage for exposure times greater than 1 sec, the critical radiant exposure is not constant but is proportional to approximately the one-fourth power of the exposure time. (Author)

AD-267 084 Div. 14
(TIPTM/EJH) OTS price $6.60

General Dynamics/Fort Worth, Tex.
EFFECTS OF MIXED-FIELD RADIATION ON LUBRICATING OILS,
by F. A. Haley. 15 Nov 61, 62p. incl. illus. tables, 14 refs. (Doc. no. NARF-61-22T; MR-N-281)
(Contract AF 33(657)7201)
Unclassified report

DESCRIPTORS: (*Lubricants, Greases, *Oils, *Airplane engine oils, Gamma rays, Neutrons, Neutron flux density, *Radiation damage, *Radiation effects, Physical properties, Viscosity, Combustion, High temperature research.) (Turbines, Turbojet engines, Lubrication, Metals, Oxidation, Corrosion.) (Test methods, Test equipment.)

Samples of 3 aircraft turbine lubricating oils were irradiated while being worked in a special Dynamic Test Loop. MIL-L-7808C was irradiated at 3 exposure levels ranging from 4.6 x 10 to the 6th power to 2.0 x 10 to the 9th power ergs/gm (C)-hr gammas and 6.1 x 10 to the 9th power to 3.3 x 10 to the 10th power n/csq. cm.-sec (E sub n greater than 2.9 Mev) neutrons; GTO-790 was irradiated at a gamma dose rate of 3.4 x 10 to the 8th power ergs/gm(C)-hr and 8.3 x 10 to the 9th power n/c sq. cm.-sec (E sub n greater than 2.9 Mev) associated neutrons; MIL-L-9236B was irradiated at a gamma dose rate of 4.6 x 10 to the 8th power ergs/gm(C)-hr and 1.1 x 10 to the 10th power n/c sq. cm.-sec (E sub n greater than 2.9 Mev) associated neutrons. Bulk-oil temperatures ranged from 275 to 300 F during irradiation. MIL-L-7808C is somewhat more sensitive to reactor radiation than GTO-790 or MIL-L-9236B, both of which exhibited a similar resistance to radiation. (Author)

15. MATHEMATICS

AD-266 122 Div. 15
(TIPTP/JDP) OTS price $1.10

Rutgers U., New Brunswick, N. J.
AN APPROXIMATION TO THE PROBABILITY INTEGRAL OF THE GAMMA DISTRIBUTION,
by Roger S. Pinkham. Sep 61, 9p. incl. illus., tables (Technical rept. no. 8)
(Contract Nonr-40416)
Unclassified report

DESCRIPTORS: (*Integral equations, Probability, Numerical analysis, Analytic geometry, *Statistical distributions, Functions, Tables.)

Consider a solid cube C of side 2x in n-space and a solid ball B of radius R. B and C are each centered at the origin, and R and x are so chosen as to yield the same volume. Let f be the unit, spherically symmetric normal in n-space centered at the origin. The integral of (f dv) around C is less than the integral of (f dv) around B, where the integrals are multiple and dv denotes the cartesian volume element in n-space. An examination shows that nowhere is the integral nature of n vital; so the geometric picture is sacrificed and the fractional n is considered. This yields an approximation for the probability integral of the gamma distribution for small values of the shape parameter. Numerical details are presented which show the approximation to be good.

AD-266 134 Div. 15
(TIPTP/JDP) OTS price $12.50

Groton Associates, Inc., Mass.
INVESTIGATION OF SEQUENTIAL METHODS IN DESIGN AND ANALYSIS OF EXPERIMENTS.
Rept. for Dec 59-Dec 60,
by Bhaskar K. Ghosh and Harold Freeman. Oct 61, 173p. incl. illus. tables, 49 refs.
(Contract DA 19-129-qm-1515; Proj. FEA MRS 60-7j)
(QREC TR-R11) Unclassified report

DESCRIPTORS: (*Sequential analysis, Design, Experimental data, Statistical processes.) (*Analysis of variance, *Sequential analysis, Tables, Statistical distributions, Statistical tests, Probability.)

A sequential analysis of variance is developed, tables of distribution of the required statistics computed, and applications to field testing problems demonstrated. Topics include: the sequential probability ratio test for simple hypotheses; a comparison of the theories of Wald, Barnard, and Cox for testing composite hypotheses; development of a sequential analysis for the fixed-effects model; development of a sequential analysis for the random-effects model, discussion of properties of sequential tests, including average sample number, cost functions, power, operating characteristic functions, use of range and mean deviation, and selection of sequential tests; and development of formulas for computing the required statistical tables. (Author)

AD-266 139 Div. 15, 30
(TIPTP/JW) OTS price $3.60

David Sarnoff Research Center, Princeton, N. J.
MACHINE THEOREM PROVING,
by G. Cooke. 28 Sep 61, 32p. (Scientific rept. no. 1)
(Contract AF 19(604)8422)
(AFCRL 925) Unclassified report

DESCRIPTORS: (*Operational calculus, Coding, Theory, Computers, Computer logic, *Programming.)

A proposal is made to program a computer to prove theorems in the propositional calculus, where the proofs generated proceed along similar or better reasoning lines as compared to those produced by human reasoning. The method consists of a system of suppositions and deductions where the theorem is the last deduction and where each of the deductions must be justified by the application of specified rules of deduction. The class of proofs over which the algorithm produce minimal proofs is the class of all proofs in which all subgoals are subformulas or negations of subformulas of the given theorem.

AD-266 222 Div. 15
(TIPTP/MFA) OTS price $3.60

Wisconsin U., Madison.
A USEFUL METHOD FOR MODEL-BUILDING,
by G. E. P. Box and William Hunter. Aug 61, 34p. incl. illus. tables (Technical rept. no. 2)
(Contract Nonr-120217, Proj. NR 042 222)
Unclassified report

DESCRIPTORS: (*Mathematical analysis, *Factor analysis, Combinatorial analysis, Nonlinear systems, Least squares method.) (Experimental data, Chemicals, Processing, Tables.)

A simple method is presented for checking and modifying a mathematical model in which the estimated constants of the system are treated as the observations. There is no reason to suppose that this method is new but it is felt that it is of sufficient general interest to be formally recorded. (Author)

AD-266 223 Div. 15
(TIPTP/MFA) OTS price $1.60

Wisconsin U., Madison.
ROBUSTNESS TO NON-NORMALITY OF REGRESSION TESTS,
by G. E. P. Box and G. S. Watson. Aug 61, 18p.
(Technical rept. no. 4)
(Contracts Nonr-120217, Proj. NR 042 222 and DA 36-034-ORD-2297, Proj. 1715)
Unclassified report

DESCRIPTORS: (*Statistical tests, Combinatorial analysis, Numerical analysis, Distribution theory, Transformations (Mathematics), Linear systems, Equations.)

A demonstration of the overriding influence which the numerical values of the regression variables have in deciding sensitivity to non-normality and to demonstrate the essential nature of this dependency is presented. A simple approximation to the distribution of the regression F statistic in the non-normal case is described. This shows that it is the extent of non-normality in the regression variables (the x's), which determines sensitivity to non-normality in the observations (the y's). Results are illustrated for certain familiar special cases. In particular the well-known robustness of the analysis of variance test to compare means of equal-sized groups and the notorious lack of robustness of the test to compare two estimates of variance from independent samples are discussed in this context. (Author)

AD-266 252 Div. 15
(TIPTP/MFA) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FULL ASYMPTOTIC CONTRIBUTION OF AN INTERIOR EXTREMUM TO AN N-DIMENSIONAL INTEGRAL DEPENDING ON A LARGE PARAMETER,
by V. Pressman. Aug 61, 15p. incl. illus.
(USA RDL Technical rept. no. 2223)
Unclassified report

DESCRIPTORS: (*Transformations (Mathematics), Combinatorial analysis, Complex variables, *Fourier analysis, Integrals, Taylor's series, Equations, Functions.)

An n-dimensional integral with an oscillatory integrand depending on a large parameter is considered. The value of this integral, as the parameter becomes infinite, is the sum of contributions from the neighborhood of certain critical points. The full asymptotic contribution at a critical point which is an interior extremum is calculated for any n. It is shown that this formula reduces to known results for certain special cases. The technique employed is to reduce the n-dimensional integral to a one-dimensional integral and then to employ known results obtained by the method of stationary phase for one-dimensional integrals to obtain the final answer. (Author)

AD-266 257 Div. 15
(TIPTP/GRW) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON LINEAR EQUATIONS IN DUAL TO (LF) SPACES,
by W. Slowikowski. Aug 61, 16p. (MRC technical summary rept. no. 244)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Equations, *Functional analysis, Distribution theory, Sequences, Conformal mapping.

The equivalence of some natural conditions and inequalities to solvability of linear equations in the dual to (LF) spaces is proved. The most important applications concern the case of distributions spaces; the standard distribution spaces notation is used. In order to stress the functional analysis character of the results, the general functional analysis notation is used. (Author)

AD-266 267 Div. 15
(TIPTP/JDP) OTS price $7.60

Cornell U. Sibley School of Mechanical Engineering, Ithaca, N. Y.
CONTRIBUTIONS TO THE THEORY OF THE TWO-SAMPLE PROBLEM.
Doctoral thesis,
by Saul Blumenthal. 1 Oct 61, 71p. 13 refs.
(Technical rept. no. 17)
(Contract AF 49(638)230)
(AFOSR 1786) Unclassified report

DESCRIPTORS: (*Sampling, *Sequential analysis, *Statistical tests, Statistical functions, Probability.) Thesis.

The problem of determining whether two samples came from the same population (two-sample problem) is discussed. Based on m and n independent observation on two independent stochastic variables, x and y, the null hypothesis that x and y have identical cumulative distribution functions is tested. A sequential test for the two-sample problems is described, and its properties studied. When the size of the test is small and the power near unity, the Wald approximations to the average sample size of the Wald sequential probability ratio test applied to the binomial distribution are shown to be valid approximations to the average sample size of the proposed two-sample test. An estimate of the efficiency of the proposed sequential test is obtained by comparing the approximation of its expected sample size to an approximation of the sample size required by a fixed sample size test when the two tests guarantee the same error probabilities.

AD-266 268 Div. 15
(TIPTP/MFA) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
COMPUTING ERROR BOUNDS IN SOLVING LINEAR SYSTEMS,
by J. Schroder. July 61, 28p. incl. illus. tables (MRC Technical summary rept. no. 242)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Linear systems, Equations, Algebra, *Matrix algebra, Differential equations, *Errors.) (Digital computers, Mathematical computer data, Tables.)

A method is presented for computing a vector vO, the calculation of which has the vectors BnvO. This forms an iterative procedure parallel to an approximation procedure. This estimation procedure can be programmed for computers as easily as the approximation procedure. The method theoretically is always successful for some p if the matrix B is irreducible and non-cyclic and if the maximal root lambda of B is smaller than 1. Practically, lambda will have to satisfy somewhat stronger conditions because one can only calculate with a certain number of digits and one can only perform a certain number of iteration steps. (Author)

AD-266 322 Div. 15
(TIPTP/JDP) OTS price $5.60

Syracuse U. Coll. of Engineering, N. Y.
MULTIDIMENSIONAL INFORMATION THEORY.
Annual rept. for June 61,
by Walter R. Baum and Stanford Goldman.
10 Sep 61, 54p. incl. illus. (Rept. no. EE 494-6109A)
(Contract Nonr-66910)
Unclassified report

DESCRIPTORS: (*Information theory, Sampling, Functions.) (Information theory, Abstracting, Geometry, Integrals.)

Multi-dimensional information theory is developed, particularly those aspects which are concerned with the dimensionality of the information or those which conventional information theory (usually one dimensional) has ignored or neglected. A complete development is given of principles and methods for a multidimensional generalization of the sampling theorem considered as an interpolation theorem. (Author)

AD-266 355 Div. 15
(TIPTP/GRW) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
SAMPLING FROM A RAYLEIGH DISTRIBUTION,
by Everett Taft. Nov 61, 13p. incl. illus. tables (Rept. no. 3709-10-T)
(Contract AF 33(616)7391)
Unclassified report

DESCRIPTORS: *Radar confusion reflectors, *Release mechanisms, Statistical analysis, *Sampling, *Statistical distributions, Statistical functions, Tables.

This analysis provides a table of the exact values of the sampling distribution for a Rayleigh population. The table can be used in solving certain radar problems. In developing the theoretical background required for the computation of the sampling distribution, use was made of both the cumulated terms of the Poisson exponential binomial limit and of standard CHI square tables. (Author)

AD-266 356 Div. 15
(TIPTP/JW) OTS price $4.60

Statistical Lab., Iowa State U. of Science and Tech., Ames.
IRREGULAR FRACTIONS OF FACTORIAL EXPERIMENTS.
Rept. on Investigation of Analysis of Variance,
by Sidney Addelman. Feb 61, 39p. incl. tables.
(Contract AF 33(616)5599, Proj. 7071)
(ARL-9) Unclassified report

DESCRIPTORS: (*Analysis of variance, Statistical analysis, *Combinatorial analysis.) (Statistical functions, Statistical tests, Experimental data.)

The development of fractional plans which consist of irregular fractions of factorial experiments is presented. The plans found to be of greatest practical value are the 3/2 to the M power replicate plans for the 2 to the N power experiment. Although these plans introduce correlations between some of the estimates, the correlations do not affect individual tests on the parameters. Irregular fraction plans often permit the estimation of main effects and two-factor interactions with fewer trials than is required with a plan which yields uncorrelated estimates of these parameters. The irregular fraction plans permit a simple procedure for obtaining estimates of the main effects and interactions of interest together with estimates of their variances, covariances and correlation coefficients. Examples of 3/2 to the M power replicate plans for the 2 to the N power experiment are presented. (Author)

AD-266 360 Div. 15, 20
(TIPTP/MFA) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
BROADENING IN THE MASTER EQUATION,
by Paul L. Kelley. 25 Oct 61, 20p. (Rept. no. 81G-1)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Energy, *Equations, Electrons, Phonons, Scattering.) (Functions, Operators (Mathematics), Matrix algebra, Integral equations, Differential equations, Integration.)

Broadening has been introduced into the collision term of the master equation. Instead of the delta function condition on the energy of the initial and final states, we have a Lorentzian condition in the collision term. This implies scattering occurs from a state of energy E to states in a region from (E-gamma) to (E+gamma). The broadening term is evaluated for the electron-phonon interaction. (Author)

AD-266 468 Div. 15
(TIPTP/GRW) OTS price $1.60

Duke U., Durham, N. C.
SOME NONLINEAR SYSTEMS OF DIFFERENTIAL EQUATIONS EQUIVALENT TO LINEAR SYSTEMS,
by F. G. Dressel and J. J. Gergen. Oct 61, 11p.
(Contract AF 49(638)892, Proj. 9769)
(AFOSR-1419) Unclassified report

DESCRIPTORS: *Non-linear differential equations, *Differential equations, Theory, Linear systems.

The problem, what equations of order n have general solutions expressible in the form of a variable set of solutions of a fixed linear differential equation, is considered for systems of two and three equations. Results for the case n equal to 2, closely parallel the results for linear homogeneous second order equations. For linear systems in three unknowns, information of a negative nature is obtained. That is, results for n equal to 2 cannot be extended to systems in three unknowns within the broad class of solution forms examined. (Author)

AD-266 471 Div. 15, 25
(TIPTP/GRW) OTS price $1.60

Duke U., Durham, N. C.
AN AXISYMMETRIC BOUNDARY VALUE PROBLEM OF MIXED TYPE FOR A HALF-SPACE,
by Morton Lowengrub and I. N. Sneddon. Oct 61, 11p.
(Contract AF 49(638)892, Proj. 9769)
(AFOSR-1667) Unclassified report

DESCRIPTORS: *Elasticity, Solids, Deformation, Mathematical analysis, *Integral equations.

In problems in the mathematical theory of elasticity related to the symmetric deformation of an infinite elastic solid with an external crack we encounter the problem of determining an axisymmetric function which is harmonic in the half-space and satisfies the mixed boundary conditions. The solution of this mixed boundary value problem is reduced to that of a pair of dual integral equations whose solution is derived by an elementary method. By means of this solution, an integral representation of the axisymmetric function can be constructed; its properties are discussed. The forms of the solution in certain special cases are then derived. (Author)

AD-266 530 Div. 15
(TIPTP/GRW) OTS price $1.60

Hebrew U. (Israel).
TAUBERIAN CONSTANTS FOR THE (J,f(x)) TRANSFORMATIONS,
by Amnon Jakimovski. June 61, 17p. (Technical scientific note no. 20)

(Contract AF 61(052)187)
(AFOSR-1503) Unclassified report

DESCRIPTORS: *Series, *Transformations (Mathematics), Sequences, Functions, Real variables, Complex numbers, Inequalities.

The value of the best Tauberian constants for a class of J, f(x) transformations is obtained. The class of (J,f(x)) transformations is defined as the sequence-to-function analogues to the Hausdorff transformations. (Author)

AD-266 570 Div. 15, 25
(TIPTP/MFA) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME ISOPERIMETRIC INEQUALITIES IN THE TORSION PROBLEM FOR MULTIPLY-CONNECTED REGIONS,
by L. E. Payne. Oct 61, 21p. (Technical note no. BN-263)
(Contract AF 49(638)228)
(AFOSR-1668) Unclassified report

DESCRIPTORS: (*Numerical analysis, Mechanical properties, *Beams, Deformation, *Stresses.) (Algebra, Calculus of variations, Partial differential equations, Integration.)

A number of isoperimetric inequalities involving the solution to the torsion problem for multiply-connected cross sections are derived. It is indicated how these inequalities may be used to give maximum principles in certain types of boundary value problems. (Author)

AD-266 574 Div. 15
(TIPTP/MFA) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE RELAXATION OF MOMENTS DERIVED FROM A MASTER EQUATION,
by Kurt E. Shuler, Knud Andersen, and George H. Weiss. Nov 61, 22p. (Technical note no. BN-264)
(Contract AF 18(600)1315; In cooperation with National Bureau of Standards)
(AFOSR-1688) Unclassified report

DESCRIPTORS: (*Relaxation time, *Equations of state, Harmonic analysis, Distribution theory, Functions, Probability.)

A study has been made of the relaxation of the moments of probability distributions whose time evolution are governed by a master equation. (Author)

AD-266 580 Div. 15, 8
(TIPTP/TL) OTS price $3.60

National Biomedical Research Foundation, Silver Spring, Md.
COLLECTED PAPERS ON SWITCHING CIRCUIT THEORY AND LOGICAL AND SYSTEMS DESIGN,
by Robert S. Ledley, Don R. Boyle, and James B. Wilson. Oct 61, 36p. incl. illus. tables.
(Contract Nonr-326500)
Unclassified report

DESCRIPTORS: (*Switching circuits, Theory, Computer logic, Cybernetics.) (Mathematical logic, Electronic systems, Design, Electrical networks, Matrix algebra, Memory, Memory devices.) (Synchronizers, Circuits, Pulse communication systems, Sequences.) (Time *Digital computers.) (Algebra, Transformations (Mathematics), *Digital systems, Programming, Automatic, Computers.) Tables.

Contents:
Boolean matrices applied to sequential circuit theory and threshold logics
Multivalued logic devices for simulating threshold neurons
Organization of Large Memory Systems
An algorithm for rapid binary division

AD-266 633 Div. 15
(TIPTP/JDP) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
FOOTNOTE TO A PAPER OF ROY, GREENBERG AND SARHAN,
by J. L. Brenner. Aug 61, 8p. incl. illus.
(MRC Technical summary rept. no. 255)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Determinants, *Polynomials, *Matrix algebra, Numerical methods and procedures.)

Roy, Greenberg, and Sarhan evaluate determinants, characteristic polynomials, and roots of certain matrices by ad hoc methods. Several of the matrices these authors consider are related, and can be solved by a single method. The ideas needed are elementary enough so that a brief sketch gives all the necessary material. The elementary method of attack yields a little more than the ad hoc methods; with it, the proper vectors can also be written down at sight. (Author)

AD-266 634 Div. 15, 12
(TIPTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
THE EQUATORIAL ORBIT OF A NEAR-EARTH SATELLITE,
by J. L. Brenner. Aug 61, 15p. (MRC Technical summary rept. no. 258)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (Satellites, *Satellite vehicles, *Orbital flight paths, Earth, Gravity.) (*Errors, *Analysis.) (Equations, Differential equations, Motion.)

The orbit of a near-earth satellite is described by finite equations x equals x(t), y equals y(t), z equals z(t) which closely approximate the position of the satellite. Various sets of approximate equations were proposed by various authors but in no case has it been possible to establish rigorous error bounds for these solutions. This is true even when the only non-inverse-square force is due to the oblateness of the earth. Realistic and strict numerical error bounds for an approximate solution are given. Special though this case is, a complete error analysis may have some interest. (Author)

AD-266 635 Div. 15
(TIPTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
PROXIMATE ORDERS AND DISTRIBUTION OF a-POINTS OF AN ENTIRE FUNCTION,
by Shankar H. Dwivedi. Aug 6, 15p. (MRC technical summary rept. no. 259)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Functional analysis, Functions, *Distribution theory, Numerical analysis, Integrals, Equations.)

A mathematical analysis of proximate orders and distribution of a-points of an entire function are given. Theorems and proofs of these functions are presented.

AD-266 661 Div. 15
(TIPTP/JDP) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
A STRONG CONVERSE OF THE WIENER-LEVY THEOREM,
by Walter Rudin. Sep 61, 13p. (MRC Technical summary rept. no. 261)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Functions, Complex variables, Series, Trigonometry, Integral transforms, *Groups (Mathematics), Algebras.)

Let A denote the class of all complex functions F on the unit circle which are sums of absolutely convergent trigonometric series. Let B be the class of all complex functions G on the circle which operate on Fourier transforms. The Wiener-Levy theorem asserts that if F is analytic on the range of some G belonging to A, then F (G) is also in A. A converse is established that F must be analytic on the closed internal (-1,1) if, for each G in A, there is a class of complex functions less than 2, such that F (G) is in B. The problem is considered on the arbitrary infinite compact abelian group instead of the unit circle.

AD-266 671 Div. 15
(TIPTP/JDP) OTS price $1.10

Trieste U. (Italy).
RESEARCH STUDY OF NAVIER-STOKES EQUATIONS.
Technical rept., 1 July 60-30 June 61,
by Giovanni Prodi. 28 July 61, 9p.
(Contract AF 61(052)414)
(AFOSR-1501) Unclassified report

DESCRIPTORS: (*Partial differential equations, Theory, Measure theory.)

An account is given of the research work accomplished on the subject, Analytical problems concerning the equations of Navier Stokes. The report consists of the description and estimation of the results and the indication of some problems which still remain open. (Author)

AD-266 672 Div. 15
(TIPTP/JDP) OTS price $4.60

Trieste U. (Italy).
ON PROBABILITY MEASURES RELATED TO THE NAVIER-STOKES EQUATIONS IN THE 3-DIMENSIONAL CASE.
Rept. on Research Study of Navier-Stokes Equations,
by Giovanni Prodi. 28 July 61, 48p. 18 refs.
(Technical note no. 2)
(Contract AF 61(052)414)
(AFOSR-1500) Unclassified report

DESCRIPTORS: (*Measure theory, Probability, *Partial differential equations, Functional analysis.)

For the Navier Stokes system in 3-dimensional case, no theorem is known about existence and uniqueness in the large. The notion of half-invariant measure, based on the only prerequisite of a local existence and uniqueness theorem is introduced. Under certain hypothesis for a half-invariant measure, the existence and uniqueness theorem holds for almost all initial values, and the measure is invariant. The research is concluded by giving two criteria for the existence of half-invariant measures. (Author)

AD-266 816 Div. 15
(TIPTP/MFA) OTS price $3.60

Cambridge Acoustical Associates, Inc., Mass.
ASYMPTOTIC FORMULAS AND COMPUTATIONAL METHODS FOR SPHEROIDAL WAVE FUNCTIONS,
by Alexander Silbiger. Oct 61, 34p. incl. illus.
(Rept. no. U-123-48)
(Contract Nonr-273900)
Unclassified report

DESCRIPTORS: (*Special functions, *Wave analysis, Bessel functions, Series, Integral equations, Matrix algebra.) (Geometry, Cylindrical bodies.)

Prolate radial functions are presented for which a considerable number of formulas are included. Spheroidal wave functions correspond to combinations of extreme values of the geometric parameter, defining the eccentricity of a spheroidal surface, and of two wavelength parameters, measuring the ratio of wavelength to the minor axis and to the major axis. Functions computed by the various formulas are compared graphically with tabulated values. It is shown that with the aid of these formulas adequate approximations can be obtained except for a comparatively restricted range of parameters. A brief discussion is devoted to oblate spheroidal functions. (Author)

AD-266 826 Div. 15
(TIPTP/TL) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A LOWER BOUND FOR THE SUM OF INDEPENDENTLY DISTRIBUTED CONTINOUS RANDOM VARIABLES,
by B. Reiffen. 26 Oct 61, 5p. (Rept. no. 25G-1)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Statistical functions, Probability, Density, Theory.) (Integral transforms, Integration, Inequalities, Integral equations.)

The Chernoff bound is widely used to upper bound the distribution function of the sum of independent and identically distributed random variables. For the case of continuous variables with

finite third moments, a lower bound is derived with exponential behavior identical to that of the upper bound and with a coefficient which, for large n, behaves as 1/square root of n.. (Author)

AD-266 871 Div. 15
(TIPTP/JDP) OTS price $5.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE RIEMANN MATRIX OF A HYPERBOLIC SYSTEM,
by G. F. D. Duff. Aug 61, 58p. 23 refs. (MRC Technical summary rept. no. 246)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Matrix algebra, *Partial differential equations, Series, Fourier analysis, Integral transforms, Operators (Mathematics).)

Consideration is given to linear first order partial differential equations with constant coefficients, which are hyperbolic. The structure and behavior of their elementary solutions are examined. The study is confined to systems which are homogeneous of the first order in derivatives, and enables one to analyze, separately, two aspects (differential and matrix) of the operators in the differential system. The Riemann matrix (the matrix elementary solution of the system) is derived from a spherical mean of the spectral resolution of the coefficient matrix. An alternative approach, based on the convergence theory of Fourier series and integrals, is used. The relation between a first order system and the irreducible equation of higher order satisfied by certain combinations of the components is examined. The Riemann matrix is then expressed as an integral over the velocity or spectral surface related to the matrix operator.

AD-266 923 Div. 15
(TIPTP/MFA) OTS price $1.10

Chicago U., Ill.
INVESTIGATIONS IN ALGEBRAS AND FINITE FIELDS.
Final rept. 1 Oct 57-30 Sep 61,
by I. Kaplansky. Oct 61, 2p.
(Contract DA 11-022-ORD-2492, Proj. TB2-000)
(AROD rept. no. 1833:6) Unclassified report

DESCRIPTORS: *Research program administration, *Algebras.

AD-266 926 Div. 15, 5, 28
(TIPTB/CCH) OTS price $4.60

Applied Psychological Services, Wayne, Pa.
INFORMATION TRANSFER IN DISPLAY CONTROL SYSTEMS. I. SURVEY AND VARIABLES INCLUDED IN A PROPOSED DISPLAY EVALUATIVE INDEX.
Quarterly progress rept. no. 1 and Interim rept. 16 June-16 Sep 61,
by Arthur I. Siegel and William Miehle.
16 Sep 61, 44p. incl. illus. tables.
(Contract DA 36-039-sc-87230, Proj. 3A99-01-001)
Unclassified report

DESCRIPTORS: (Design, *Real variables, Information theory of *Display systems, Manned.) (*Probability, Functional analysis, Communication theory, Human engineering.) Cybernetics.

The logic and basis of an index for evaluating the information transfer characteristics of the displays in a display-human operator-control system are presented. The purpose of the index is to allow comparative, quantitative evaluation of proposed systems while the systems are in the system concept or the early design stages. The index is related to a logic derived from communications theory and includes five bases. The technique for deriving the scores on which the index depends is described by example and proof of the independence of the variables which form the substrate of the index is offered. (Author)

AD-266 933 Div. 15
(TIPTP/JDP) OTS price $1.60

Brown U., Div. of Applied Mathematics, Providence, R. I.
EXTENSION TO THEORY OF TIME SERIES ANALYSIS.
Quarterly rept. no. 13, 1 Aug-31 Oct 61,
by Walter Freiberger and Murray Rosenblatt.
31 Oct 61, 19p.
(Contract DA 36-039-sc-78130)
Unclassified report

DESCRIPTORS: (*Series, *Statistical analysis, Theory.) (*Statistical processes, *Vector analysis, Sampling, Programming.) (*Sampling, Matrix algebra, Statistical functions, Least square methods.)

Methods are developed for the analysis of vector-valued random processes (or multiple time series) and of processes with vector arguments, and for the analysis of small or moderate samples. Both spectral analysis and regression analysis are considered. Progress is reported on spectral analysis of vector-valued processes; analysis of processes with vector arguments; and the influence of finite sample size on the covariance matrices of the least square and Markov estimates in regression analysis. (Author)

AD-266 942 Div. 15
(TIPTP/JDP) OTS price $1.10

Chicago U., Ill.
INVESTIGATIONS IN MATHEMATICS.
Final rept. 1 Oct 58-30 Sep 61,
by A. A. Albert. 20 Oct 61, 8p.
(Contract DA 11-022-ORD-2911, Proj. TB2-0001)
(AROD 2160:9) Unclassified report

DESCRIPTORS: (*Mathematics, *Scientific research.) (*Algebras, Sequences, Tensor analysis.

AD-266 960 Div. 15, 7
(TIPTE/CRJ) OTS price $1.10

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
(No title).
Final rept. and Status rept. no. 11, 1 June-31 Aug 61,
by George C. Newton, Jr. and Leonard A. Gould.
1 Sep 61, 6p.
(Contract DA 19-020-ORD-4637)
(AROD rept. no. 2001:8)
Unclassified report

DESCRIPTORS: (*Electric filters, Linear systems, Control systems, Nonlinear systems,

Statistical analysis.) (*Chemical engineering, Butadienes.) (Signals, Detection, Statistical analysis.) (Sampling, Errors.) (Feedback, Statistical functions.)

Contents:
Optimization theory
Constraints and performance indices in the analytical design of linear controls
Optimal operation of a fixed bed cyclic adiabatic reactor
Dynamic optimization and control: A variational approach
Adaptive contols
Optimum control systems for a class of stochastic signals
Detection of non-gaussian signals in gaussian noise
Nonlinear adaption in manual control systems
Nonlinear theory
Effects of quantization on feedback systems with stochastic inputs
A note on errors introduced by combined sampling and quantization

AD-266 969 Div. 15
(TIPTP/WH) OTS price $1.10

Institute of Mathematical Sciences, New York U., N. Y.
RESEARCH IN PERTURBATION THEORY IN LINEAR OPERATORS NO. 2 FOR OFFICE OF ORDNANCE RESEARCH.
Final rept. Oct 57-Sep 61,
by K. O. Friedrichs. 17 Nov 61, 4p.
(Contract DA 30-069-ORD-2154)
(AROD Rept. no. 983:19)
Unclassified report

DESCRIPTORS: (*Mathematics, *Scientific research.) (*Perturbation theory, *Operators (Mathematics).)

AD-266 970 Div. 15, 25
(TIPTP/MFA) OTS price $5.60

Naval Research Lab., Washington, D. C.
DATA REDUCTION IN PHYSICS,
by Robert G. Glasser. 17 Oct 61, 50p. (NRL Rept. no. 5667)
Unclassified report

DESCRIPTORS: (*Statistical analysis, *Probability, Distribution theory, Programming, *Physics, *Statistical data.) (Statistical functions, Special functions, Statistical distribution, Statistical tests.) (Equations, Partial differential equations, Integrals, Integral transforms, Linear systems.)

Fundamental statistical methods which have been applied to data reduction in physics are discussed. A summary of probability theory, an examination of some important statistical distributions, a discussion of the foundations of statistics, and selected applications are introduced. (Author)

AD-267 006 Div. 15
(TIPTP/JDP) OTS price $1.10

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE STUDY OF RECURSIVE PROGRESSIONS OF THEORIES.
Final rept., 1 July 59-1 July 61,
by S. Feferman and G. Kreisel. 1 July 61, 4p. 11 refs.
(Contract DA 04-200-ORD-997)
(AROD Rept. no. 2379:8) Unclassified report

DESCRIPTORS: (*Metamathematics, Mathematical logic, Theory, Functions, Mathematical prediction, Arithmetic progressions.)

Efforts centered on the characterization, by means of recursive progressions of theories, of various stratifications of mathematical proof, such as finitist, classical number-theoretical, predicative, etc. This was paired with the study, by means of hierarchies, of various stratifications of mathematical notions, such as finitist function, effective function, predicative set, etc. In an expansion of the original proposal, those parts of mathematics which are needed in a systematic study of the notion of proof were considered; in particular intuitionism, which takes the concept of constructive proof as its basic subject matter. (Author)

AD-267 007 Div. 15
(TIPTP/JDP) OTS price $1.10

Applied Mathematics and Statistics Lab., Stanford U., Calif.
RESEARCH IN THE THEORY OF RIEMANN SURFACES.
Status rept. no. 28 (Final) 1 July-30 Sep 61,
by Halsey Royden. 30 Sep 61, 3p.
(Contract DA 04-200-ORD-704)
(AROD Rept. no. 1323:21) Unclassified report

DESCRIPTORS: (*Complex numbers, *Functions, Conformal mapping, Differential geometry, Functional analysis, Algebras, Theory.)

A summary of the current research activities is presented, together with a complete list of technical reports. (Author)

AD-267 008 Div. 15
(TIPTP/JDP) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
TABLES TO FACILITATE THE COMPUTATION OF PERCENTAGE POINTS OF THE NON-CENTRAL t-DISTRIBUTION,
by George J. Resnikoff. 11 Oct 61, 17p. incl. table (Technical rept. no. 55)
(Contract Nonr-22553, Proj. NR 042-002)
Unclassified report

DESCRIPTORS: (*Statistical distributions, Statistical functions, *Tables.)

A compact set of tables is presented which will have a virtually unrestricted range for the parameters and will facilitate obtaining percentage points of the non-central t statistic. (Author)

AD-267 021 Div. 15, 12
(TIPTP/JDP) OTS price $1.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
ON THE NUMERICAL SOLUTION OF THE SECULAR

EQUATION,
by A. Danilevskiy. Nov 61, 6p. (Technical notes FRL-TN-46; Trans. from Moscow Math. Soc. 44:169-173, 1937)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Motion, Mathematical analysis, *Matrix algebra, Equations, Determinants.) (Translations, USSR.)

Reducing the matrix of the secular equation to a normal Frobenius form will give a numerical method for expanding the equation. Fewer computations are required than with older methods.

AD-267 080 Div. 15, 25
(TIPTP/JDP) OTS price $3.60

Frankford Arsenal, Philadelphia, Pa.
CONSTRUCTION AND USE OF INTEGRAL GRIDS,
by E. Pearson. Aug 61, 25p. illus. (Rept. no. R-1599)
(Proj. 505-01-003) Unclassified report

DESCRIPTORS: (*Integrals, Numerical analysis Tables, Physical properties.) (*Mechanics, Mathematical analysis, Operational calculus.)

For an x-y coordinate system, grids may be constructed to graphically determine the value of the definite integral. Properties such as area, moment of inertia, volume of solids of revolution etc., may be determined easily for irregular pieces. The limits of the integral are then defined by the boundary of the characteristic area. The same grids may also be used for evaluating definite integrals where the curves are piecewise continuous between the limits. Full size reproductions of some grids are included in the appendix. Appropriate scale factors will convert the integral boundary to the size of the grid. (Author)

AD-267 092 Div. 15, 8, 4
(TIPTP/JDP) OTS price $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
ON REALIZABILITY OF A SET OF INTEGERS AS DEGREES OF THE VERTICES OF A LINEAR GRAPH.
Interim technical rept. no. 21,
by S. L. Hakimi. 1 Sep 61, 17p. incl. illus.
(Contract DA 11-022-ORD-1983, Proj. TB2-0001)
(AROD Rept. no. 2207:13) Unclassified report

DESCRIPTORS: (*Number theory, Mathematical logic.) (*Electrical networks, Circuits, Mathematical analysis, Number theory.) (*Organic compounds, Molecular structure, Mathematical analysis, Number theory, Molecular isomerism.)

The realizability of a set of n integers as the degrees of vertices of an n-vertex linear graph is discussed. Other related problems, such as when a set of integers is realizable as a connected graph, connected graph without parallel elements, separable graph, and non-separable graph, are considered. The relationship between this problem and the problem of isomers in the organic chemistry is described. A similar problem in weighted graphs is also studied. (Author)

16. MEDICAL SCIENCES

AD-266 102 Div. 16
(TIPTB/LH) OTS price $2.60

Pennsylvania U., Philadelphia.
DEVELOPMENT OF BLOOD DIALYZER-ULTRAFILTRATOR.
Progress rept. 1 Nov 60-31 Oct 61.
by Lewis W. Bluemle, Jr. 31 Oct 61, 24p. incl. illus. tables.
(Contract DA 49-007-md-707)
Unclassified report

DESCRIPTORS: (*Medical equipment, *Artificial kidney, Design.) (Blood, Electrodialysis, Blood circulation, Fluid flow, Semipermeability, Pumps.)

Two new experimental dialyzers were designed which employ the cone membrane support. The first is a 16 parallel tube device of 1.4 sq. M surface area in which flow is crosscurrent. The second consists of a variable number of rigid discs which define countercurrent radial flow paths for blood and dialyzing fluid. Adjacent discs are held in position by interlocking, rigid peripheral rings and seals are effected by peripheral elastomeric O-rings. The cone support was also modified for the membrane blood oxygenerator, on the basis of preliminary studies which showed marked improvement in CO2 transport. Vexar, a new plastic mesh, was evaluated as a membrane support for disposable coil dialyzers. It was found to be an effective turbulence promoter and is expected to allow higher blood flow with less pressure drop. A new blood pump is under construction. It consists of three parallel, compressible tubes with integral ball-and-check valves at either end. (Author)

AD-266 104 Div. 16
(TIPTB/CCH) OTS price $1.60

Protein Foundation Labs., Jamaica Plain, Mass.
STERILIZATION OF PLASMA PROTEINS.
Final rept., 1 Dec 57-31 Jan 61,
by Robert B. Pennell, Walter Keller and others.
3 Nov 61, 16p. incl. tables, 39 refs.
(Contract DA 49-007-md-911)
Unclassified report

DESCRIPTORS: (*Purification of *Blood proteins, Serum albumin.) (Test methods, Heat, Chemicals, Particulate filters.) (*Viruses, Separation, Viricides, Ethylene oxide.) (Medical research, *Blood plasma, Purification.)

Three techniques were studied for reducing the possibility of transmission of viruses in the clinical use of plasma proteins. Heat Sterilization: Optimal conditions were found for heating solutions of transferrin and of gamma globulin for 10 hours at 60 C., a procedure that has been shown to destroy the virus of serum hepatitis. Transferrin appears to be unaltered by the heating procedure. Gamma globulin solutions retain antibody titers but are more viscous following heating. Millipore Filtration: Of six proteins studied, solutions of albumin, gamma globulin, fibrinogen and properdin, but not of beta-lipoprotein or Factor V (AcG) will pass through Millipore V F filter sheets with purported pore size of 10 millimicron, a dimension smaller than that of any known virus. Acceptance of the technique will depend upon demonstration of the failure of hepatitis virus to pass such filters. Ethylene oxide Gas: Using C14 labelled ethylene oxide conditions have been determined permitting maximum interaction of the gas with lyophilized nucleic acids and minimum interaction with lyophilized plasma proteins. The technique has been shown to inactivate tobacco mosaic virus. Experiments with inactivation of coxsackie virus in plasma have been equivocal. (Author)

AD-266 165 Div. 16
(TIPTB/CW) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
MICROBIOLOGIC STUDIES WITH OZONE MUTAGENESIS OF OZONE FOR ESCHERICHIA COLI.
by Irving Davis. June 61, 11p. incl. illus. 22 refs. (Rept. no. 61-60)
Unclassified report

DESCRIPTORS: (*Ozone, Solutions, Biochemistry on *Escherichia, Oxygen poisoning, Mutations, Biochemical genetics, Survival.)

This report is one of a series of studies designed to provide an understanding of the biologic activity of ozone at the cellular level. The possible role of ozone as a biologic mutagenic agent was undertaken. Ozone was produced by a Welsbach water-cooled corona discharge ozonator using dry, clean oxygen. Analyses for ozone in aqueous solutions were carried out spectrophotometrically. Cells of Escherichia coli were exposed to aliquots of ozonated-water stock solutions. Bacterial survivors and mutants were determined by recognized plating procedures. The mutagenesis of ozone in aqueous solutions on E. coli was studied in two mutational systems. Mutation frequencies in the streptomycin-dependence method appear to increase with increasing concentrations of ozone and decreasing survival. In the phage-resistance method, the frequency of zero-point mutants showed a significant increase after exposure of the cells to ozone. The importance of free radicals in biologic processes is discussed. It is suggested that a common pathway exists in the formation of these active radicals following irradiation, ozonization, or oxygen poisoning of biologic specimens. (Author)

AD-266 166 Div. 16
(TIPTB/CW) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
THE SEPARATION OF SERUM LIPIDS INTO FOUR MAJOR COMPONENTS BY SILICIC ACID CHROMATOGRAPHY,
by Kenneth G. Ikels. Sep 61, 7p. incl. illus. tables, 10 refs. (Rept. no. 61-108)
Unclassified report

DESCRIPTORS: (*Lipids in *Blood, Separation by Silicic acids, Chromatographic analysis.)

A method is described for the separation of serum lipids by silicic acid chromatography into four major components (cholesterol ester, triglycerides, free cholesterol, and phospholipids). This method differs from others in current use in that it utilizes 1.2 gm. of silicic acid and a sample representing 0.8 ml. of serum. The separation of the lipid components can be accomplished in 4 to 5 hours. Essentially the method requires the preparation of small silicic acid columns. Introduction of a serum sample to the acid column

results in elution of the four major lipid components with various percentages of ethyl ether in petroleum ether, methanol in chloroform, and absolute methanol. All effluents are quantitated colorimetrically with recoveries of 94 to 102 percent of known amounts of standards. (Author)

AD-266 210 Div. 16
(TIPTB/MS) OTS price $.75

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE PATHOLOGY AND MECHANICS OF EXPERIMENTAL CEREBRAL CONCUSSION.
Rept. on Acoustic Energy Control,
by Reinhard L. Friede. Mar 61, 19p. incl. illus. table, 43 refs.
(WADD TR 61-256) Unclassified report

DESCRIPTORS: (*Head injuries, Cerebral cortex, Brain, Tissues (Biology), Pathology, Laboratory animals, Cats.)

AD-266 238 Div. 16, 29
(TIPTD/CW) OTS price $1.60

Army Medical Research and Nutrition Lab., Denver, Colo.
THE INFLUENCE OF DIETARY PROTEIN LEVEL ON THE ESSENTIAL AMINO ACID REQUIREMENT OF THE WEANLING RAT,
by G. A. Leveille, H. E. Sauberlich, and J. W. Shockley. 1 Sep 61, 17p. incl. tables, 17 refs.
(Rept. no. 262)
Unclassified report

DESCRIPTORS: (*Proteins, *Diet, *Amino acids, Nutrition, *Growth, Experimental data.) Laboratory animals.

This study was made to determine the effect of various levels of essential amino acids on the growth of rats fed varying levels of dietary protein. Weanling rats were fed diets supplying 10, 15, or 20% protein; 4 levels of essential amino acids, 62, 52, 42, and 32% of the protein, were fed at each protein level. The nitrogen was supplied by egg white protein and a mixture of nonessential amino acids. Any decrease in essential amino acids at the 10% protein level resulted in decreased weight gains and feed efficiency. At the 15% level of protein, the essential amino acid level could be reduced to 52% of the protein without affecting growth or feed efficiency; while at the 20% protein level, reduction of the essential amino acids to 42% did not depress growth. The addition of tryptophan, the amino acid which appeared to be most limiting, to these diets did not influence weight gain or feed efficiency. The data are interpreted to indicate a decreasing requirement for essential amino acids, expressed as a percentage of the protein, as the level of protein is increased. (Author)

AD-266 336 Div. 16, 20
(TIPTB/CW) OTS price $ .50

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE RADIOPROTECTIVE EFFECT OF MIXTURES OF AET AND SEROTONIN.
Rept. for Oct 60-Feb 61, on Physiology Research,
by E. G. Sander and Marilyn George. June 61, 8p. incl. illus. tables.
(Proj. 7163)
(ASD TR 61-221) Unclassified report

DESCRIPTORS: (*Radioprotective drugs, *Serotonin, *Radiation injuries, Blood forming organs, Erythrocytes, Leukopenia, Control, Therapy.) Laboratory animals.

Experiments were conducted to determine the protection provided the erythropoietic system of rats against whole-body, gamma radiation by mixtures of AET (2-aminoethyl-isothiouronium bromide) and serotonin (5-hydroxytryptamine). The incorporation of iron-59 (Fe-59) into newly formed red blood cells was used as the criterion of the radioprotection afforded. Two concentrations of AET plus serotonin (40 micromoles AET, 20 micromoles serotonin and 20 micromoles AET, 10 micromoles serotonin) offered initial protection against the depression of the erythropoietic rate associated with radiation exposure. The higher concentration of this mixture produced mortality due to the toxicity of the compounds. AET and serotonin mixtures did not alter the initial radiation-induced leucopenia. However, the protected rats had higher white blood cell counts 18 days after radiation exposure. Daily gains in body weight appeared somewhat greater in the rats injected with AET and serotonin than in the nonprotected, irradiated animals. (Author)

AD-266 337 Div. 16
(TIPTB/CW) OTS price $.75

Lankenau Hospital Research Inst., Philadelphia, Pa.
EFFECTS OF SHORT-TERM DIET MODIFICATION ON HUMAN RESPONSE TO HEAT STRESS.
Rept. 1 June 60-31 May 61 on Space Biology Research,
by N. C. Birkhead, S. M. Horvath and others. July 61, 17p. incl. tables.
(Contract AF 33(616)7338)
(ASD TR 61-265) Unclassified report

DESCRIPTORS: (Man, *Stress (Physiology), *Heat, *Heat tolerance, Diet.)

To evaluate the effects of short-term dietary modifications on tolerance to heat stress, the responses of 9 young, healthy men to repeated exposures for 2 hours at 54 C, 9-18 mm Hg vapor pressure, were studied. Three or four control exposures at 4- to 7-day intervals on a normal diet for baseline data were followed by exposures after 30, and 50 or 60 days on the experimental diets. Two subjects remained on the normal diet for the entire study period; two were fed a normal Calorie 60% fat diet; two, a 1500-Calorie diet; and five, a normal Calorie 4% protein diet. No systematic differences in respiration rate, heart rate, blood pressure, degree of water loss, or rectal, mean skin, and body temperatures during the heat stress resulted from these dietary modifications. (Author)

AD-266 338 Div. 16, 30, 6
(TIPTW/RD) OTS price $.50

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A MULTICHANNEL PERSONAL TELEMETRY SYSTEM USING PULSE POSITION MODULATION.
Rept. for May 60-Apr 61, on Biophysics of Flight,
by Adolf R. Marko, Miles A. McLennan, and Edward G. Correll. July 61, 10p. incl. illus.
(Proj. 7222)
(ASD TR 61-290) Unclassified report

DESCRIPTORS: (*Telemetry systems, Telemetering transmitters, Miniature electronic equipment, Aviation personnel for Pilots.) (Monitors, Body temperature, Physiology, Cardiotachometers, Respiration.) (Pulse modulation, Coding, Recording devices, Display systems, Oscilloscopes.)

A personal telemetry system using the pulse position modulation technique was developed. The laboratory model transmits heart rate, respiration rate, and body temperature within a range of 100 feet. Compared with FM - FM Systems this system has the advantage of very low power consumption (20 milliwatts), light weight (6 ounces with batteries for 80 hours continuous operation), small size (4-3/4 by 3-1/2 by 1 inches), and sufficient accuracy and stability (2 percent baseline stability) for physiological measurements. An inexpensive, small, single-track tape recorder may be used for recording; and an extremely simple and inexpensive playback system can be used for scope display. Although more complex equipment is required for the playback system to standard pr iwriters, this penwriter decoding unit is not any more complicated than standard FM discriminators. Simple, reliable, switching-type circuits which work over a wide temperature range are used, and there is no problem with crosstalk between channels. (Author)

AD-266 366 Div. 16
(TIPTB/LH) OTS price $1.10

California Inst. of Tech., Pasadena.
PROPERTIES OF BLOOD AND IMMUNE REACTIONS UNDER CONDITIONS OF COLD AND ALTITUDE STRESS.
Final rept.,
by Dan H. Campbell. Nov 61, 6p.
(Proj. NR 102-392)
Unclassified report

DESCRIPTORS: (*Blood, Biochemistry, Laboratory animals, Rabbits.) (*Immunization, *Exposure, High altitude, Physiology, Stress (Physiology), Antibodies, Stimulation, Asthma.)

The available evidence justifies the concept of an alteration in the immune response under environmental stress. Whether or not these changes are correlated to a decrease in resistance to infection is not clear. Cold exposure, on the one hand, seems to support the idea that there may be a decrease in resistance as evidenced by the lower titers of circulating antibody and the increase in the rate of antibody decay. Antibody levels in the altitude exposed or acclimatized animal, on the other hand, are higher than in sea level controls. It may be that the expression of the immune response under environmental stress reflects a greater change in the utilization or degradation of the antibody rather than in the rate or degree of antibody production. In relation to resistance to infection, it is possible that different metabolic demands might influence not only the quantity but also the quality of the antibody produced. This latter question is one of many which shall require further study. (Author)

AD-266 555 Div. 16
(TIPTB/LH) OTS price $1.10

Cologne U. (Germany).
INVESTIGATIONS ON THE PROBLEM OF FORMATION AND PATHOPHYSIOLOGICAL SIGNIFICANCE OF BIOGENIC AMINES IN SUBLETHAL RADIATION INJURIES.
Annual technical rept. 1 Oct 60-30 Sep 61,
by Fr. Franzen. 30 Sep 61, 6p. illus.
(Contract DA 91-591-EUC-1573)
Unclassified report

DESCRIPTORS: (*Radiation effects, Physiology, Pathology, Radiobiology, Aliphatic compounds, Toxicity in Blood, Urine.)

Investigations indicated specific proof of the radiation-induced formation of toxic substances. After a single short-timed total body irradiation of 400 r, 600 r, and 800 r a considerable increase of the excretion of 3-hydroxytyramine, l-noradrenaline, adrenaline, tryptamine, 5-hydroxytryptamine, bufotenine and histamine was observed in the urine of rats. Also, in the blood of the irradiated rats, there was an increase of the named aromatic amines. (Author)

AD-266 622 Div. 16
(TIPTB/MS) OTS price $3.60

Pittsburgh U. School of Medicine, Pa.
THE MECHANISM OF ACTION OF ENDOTOXIN.
Rept. for 31 Oct 60-31 Oct 61,
by Abraham I. Braude. 31 Oct 61, 23p. illus. tables.
(Contract DA 49-007-md-872)
Unclassified report

DESCRIPTORS: (*Bacterial toxins, Toxicity, Escherichia, *Bacteremia, Nitrogen mustards, Infections, Fevers, Biochemistry, Body temperature.) (*Bacteria, Growth, Nitrogen mustards.) Immunology.

A new experimental model was developed for studying endogenous bacteremic shock due to E. coli in rabbits. Two steps are involved: (1) intravenous injection of 1.0 - 3.0 mg/kg nitrogen mustard and (2) rectal temperatures with thermistor probes. At 90-100 hours after injection, when granulocytopenia is most severe, all rabbits develop high fever, overwhelming E. coli bacteremia, and fatal shock. The origin of the bacteremia is traced to invasion of rectal mucosa by fecal organisms. The bacteria spread to the pelvic veins and induce septic pelvic thrombophlebitis. In animals with normal granulocyte counts, rectal temperatures produce an intense granulocytic inflammatory reaction in the rectum, marked congestion of pelvic veins, but no bacterial invasion of the rectum, and neither fever nor bacteremia. When granulocytopenia is minimized by protecting the femoral marrow from nitrogen mustard, bacteremic shock fails to develop from rectal temperature probing. Protection against bacteremia and shock is also provided by a combination of streptomycin-tetracycline, but fever still develops. (Author)

AD-266 789 Div. 16
(TIPTB/LH) OTS price $1.10

World Life Research Institute, Colton, Calif.
CONDUCT AN INVESTIGATION OF CIGUATERA POISON.
Final comprehensive rept. 1 June 60-31 May 61,
by Bruce W. Halstead and Donald W. Hessel.
7 Nov 61, 9p.
(Contract DA 18-108-405-cml-800)
Unclassified report

DESCRIPTORS: (*Fishes, Muscles, *Algae, *Toxicity, Chromatographic analysis, Fractionation, Purification.)

Research on ciguatera toxin resulted in a satisfactory method for extracting the toxin from fish muscle. Partial purification was also accomplished by precipitation and silicic acid adsorption. The most precise fractionation of ciguatera toxin is accomplished on a silicic acid column developed in a stepwise fashion by other containing small percentages of methanol. It is felt that further experiments using silicic acid column chromatography will lead to highly purified samples of ciguatera toxin. Paper chromatography was examined using fourteen different solvent systems, but none proved satisfactory. A toxic fraction was found in the blue-green alga, Lyngbya majascula from Palmyra Island which corresponds to the ciguatera fraction on the silicic acid column. This latter find may be a lead as to the source of the poison in nature, and may be of considerable CW-BW significance. (Author)

AD-266 880 Div. 16
(TIPTB/CCH) OTS price $1.10

National Jewish Hospital, Denver, Colo.
BIOCHEMICAL AND PHYSIOLOGICAL FACTORS OF THE IMMUNE RESPONSE.
Final rept. 15 June-1 Dec 61,
by Ignatius L. Trapani and Russell T. Jordan.
1 Dec 61, 3p.
(Contract Nonr-354500, Proj. NR 102-573)
Unclassified report

DESCRIPTORS: (Biochemistry, Physiology of *Immunization in Laboratory animals.) *Antibodies, Synthesis, Decomposition, Hormones.

Rabbits were adapted for 30 days to high altitude before immunization by a single I. V. injection of bovine serum albumin (BSA) (10 mg/kg body weight). The animals were bled periodically during the following 4 weeks. Subsequent samples could not be obtained because of an unseasonalsnowstorm which closed the Mt. Evans facilities and made it necessary to terminate this phase of the experiment and transfer the animals to the Denver laboratories where further samples were taken. At the end of 10 weeks, at which time circulating antibody levels had reached very low levels, the animals were given a secondary I.V. challenge with BSA to determine if the sojourn at altitude had any lasting effects on the immune response. Control rabbits were kept in Denver (altitude of 5,280 ft.) and treated in the same way as the experimental group. (Author)

AD-266 882 Div. 16
(TIPTB/MS) OTS price $1.75

Massachusetts Inst. of Tech., Cambridge.
ANALYSIS OF HUMAN FECAL COMPONENTS AND STUDY OF METHODS FOR THEIR RECOVERY IN SPACE SYSTEMS.
Rept. for 15 Dec 58-15 Mar 61 on Equipment for Life Support in Aerospace,
by Samuel A. Goldblith and Emily L. Wick.
Aug 61, 57p. incl. illus. tables, 42 refs.
(Contract AF 33(616)6136, Proj. 6373)
(ASD TR 61-419) Unclassified report

DESCRIPTORS: (*Metabolic products, Closed-cycle ecological systems.) (*Metabolic products, Chemical analysis, Nutrition, Food, Separation.)

Human fecal constituents were investigated for possible use in waste recovery systems aboard a space vehicle during a journey of long duration (1-3 months). It was necessary to first isolate them and then to evaluate their potential usefulness. A review of literature indicated that there is incomplete knowledge of human fecal components, that detailed knowledge of the chemical nature of only a small proportion of fecal components exists, and that these have rarely been isolated in any quantity. However, protein, minerals and trace elements present in feces are possibly useful materials. Investigation indicated that use of fecal protein or its component amino acids as nutrients for man would require supplementation of the diet. A number of minerals were isolated. If found to have nutritional value, feces could possibly serve as an available source of supply. Insufficient information (e.g., authentic space diets and identification of useful fecal components) exists to compare or recommend feasible methods for recovery. (Author)

AD-266 902 Div. 16
(TIPTB/LH) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EFFECTS OF LOW-LEVEL, REPEATED EXPOSURES AND LONG-TERM CONSIDERATIONS OF IONIZING RADIATION,
by Gerrit L. Hekhuis. Sep 61, 9p. 49 refs.
(Rept. no. 61-93)
Unclassified report

DESCRIPTORS: (*Radiobiology, *Radiation effects, *X rays, Theory, Dosage, Determination, Laboratory animals, Man, Leukemia, Cancer, Age, Genetics.)

AD-266 980 Div. 16
(TIPTB/CW) OTS price $1.10

Pittsburgh U., Pa.
THE INTERNAL STRUCTURE OF VIRUSES.
Technical rept. no. 2, 1 Dec 60-30 Nov 61,
by Irwin J. Bendet and Max A. Lauffer.
30 Nov 61, 9p.
(Contract Nonr-62412, Proj. NR 304-489)
Unclassified report

DESCRIPTORS: (*Viruses, *Bacteriophages, Sedimentation, Histology, *Cytochemistry, Tryptophan, Nucleic acids, Molecular structure, Electron microscopy, Ultracentrifuges.)

AD-267 002 Div. 16
(TIPTB/CW) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EFFECT OF CHANGES OF AMBIENT TEMPERATURE ON SPONTANEOUS ACTIVITY OF HYPOTHYROID RATS,
by Melvin J. Fregly. Sep 61, 11p. incl. illus. 21 refs. (Rept. no. 61-82)
Unclassified report

DESCRIPTORS: (*Thiouracils, Pharmacology on *Thyroid gland of Laboratory animals, Exercise, Exposure.)

The antithyroid drug, propylthiouracil (PTU), administered to male rats for 4 wk, did not reduce spontaneous running activity in air at 25 C. When room temperature was lowered to 8 C. for 4 days, PTU-treated rats increased their activity level during the first day of exposure

but decreased it thereafter. Control rats responded similarly on the first day but continued to increase activity during each subsequent day in cold. In other experiments PTU-treated and control rats were lightly restrained and exposed acutely to air at 5 C. in individual cages. A sensitive transducer converted movement of the cage to electrical impulses which were recorded on a polygraph. Colonic temperature of each rat was recorded simultaneously by a potentiometer. Mean colonic temperature of PTU-treated rats continued to fall throughout the cold exposure and decreased approximately 6 C. in 3 hr. These rats also responded to cold initially with an increase in activity which became maximal when colonic temperature fell 3 to 4 C. This maximal effort occurred too late, however, to prevent further fall of colonic temperature. The results suggest that regulation of body temperature in cold air by adjustment of activity level is an important aspect of the total regulatory mechanism and that hypothyroidism alters the relationship between colonic temperature and activity level. (Author)

AD-267 003 Div. 16, 20
(TIPTB/CDW) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
SUBACUTE RADIATION DEATH IN CHEMICALLY PROTECTED MONKEYS,
by James A. Pitcock and George S. Melville, Jr. Sep 61, 5p. incl. tables, 12 refs. (Rept. no. 61-102)
Unclassified report

DESCRIPTORS: (*Radiation injuries, X-rays, Dosage, Survival.) (*Laboratory animals, *Lymphopenia, Radioprotective protective, Pharmacology.)

A new mode of death caused by radiation was characterized in monkeys. Called subacute death, it occurs in animals that would not ordinarily survive 30 days after a supralethal dose of x-rays but do so because of protection conferred by chemical treatment prior to irradiation. The syndrome includes lymphocytopenia, usually accompanied by diarrhea. Histologically, atrophy of lymphoid tissue, along with a relatively normal bone marrow, is typically found. The spectrum of other lesions found at death is also different from that found after acute radiation death. (Author)

AD-267 004 Div. 16
(TIPTB/CW) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EFFECTS OF INTRAVENOUS FAT EMULSION ON O(2) TRANSPORT AND ALVEOLAR-ARTERIAL GAS TENSIONS IN DOGS,
by Stephen M. Cain. Oct 61, 7p. incl. illus. tables, 15 refs. (Rept. no. 61-116)
Unclassified report

DESCRIPTORS: (*Intravenous feeding, *Colloids of *Fats and *Dextran, Physiology.) (Lungs, Arteries, *Oxygen consumption, *Anoxia.)

Ten dogs were made progressively hypoxic by rebreathing from an air-filled spirometer. Arterial blood samples were drawn at five levels of alveolar Po2 (100, 70, 55, 40, and 25 mm. Hg). Additional samples for the determination of O2 capacity were drawn before and after the progressive hypoxia. Half the animals were then given 25 ml./kg. of fat emulsion intravenously and the others were given the same amount of dextran. The same sampling procedure was repeated and the bloods were analyzed for O2 content. In separate experiments, the same procedure was followed for 5 dogs but only Lipomul was given and the arterial blood was analyzed for Po2 and Pco2. Oxyhemoglobin dissociation curves were constructed from the values of saturation at progressively falling alveolar Po2. These were transformed into a linear equation by the Hill equation and treated statistically. No significant differences were found between any of the comparisons made of slope or displacement. It was concluded that lipemia offered no practical hindrance to the uptake of O2 by the red cell. Alveolar-arterial gas tension differences revealed no change after intravenous fat emulsion in the Po2 difference, but there was a threefold increase in the Pco2 difference. (Author)

AD-267 041 Div. 16, 25
(TIPTB/CW) OTS price $1.00

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
WEIGHTLESSNESS AND PERFORMANCE. A REVIEW OF THE LITERATURE.
Rept. on Human Performance in Advanced Systems, by J. P. Loftus and Lois Reel Hammer. June 61, 34p. 125 refs.
(Proj. 7184)
(ASD TR 61-166) Unclassified report

DESCRIPTORS: (*Weightlessness, Simulation, Production, Acceleration, Water, Optical illusions, Ear, Sensitivity, Blood circulation, Respiration, Motion, Motion sickness, Psychology, Physiology, Bibliography.)

The implications of weightlessness as encountered in space flight are discussed, and the known research dealing with the psychological and physiological effects of zero gravity is critically reviewed. Topics are grouped under the headings of orientation, psychomotor performance, and physiological functions, with a special section on methods of research. The major problem area indicated is the effect of weightlessness on gravity oriented sensory mechanisms, particularly the vestibular apparatus, and consequently on both physiological functions and psychomotor performance. An extensive bibliography is included. (Author)

AD-267 056 Div. 16
(TIPTB/JAB) OTS price $3.00

Litton Systems, Inc., Woodland Hills, Calif.
ELECTRODES FOR RECORDING PRIMARY BIOELECTRICAL SIGNALS.
Rept. on Biophysics of Flight,
by M. Sosnow and E. Ross. Sep 61, 189p. incl. illus. tables.
(Contract AF 33(616)7304, Proj. 7222)
(ASD TR 61-437) Unclassified report

DESCRIPTORS: (*Electrocardiography, *Electroencephalography, *Electrodes, Classification, Preparation, Electrical properties, Materials, Metals.) (*Galvanic skin response, Test methods, Electric currents, Skin, Electrical properties.)

This report summarizes electroding practices in the biological sciences. The literature concerning major problems associated with physiological electroding techniques in common use is reviewed.

Primary areas of interest and discussion are: (1) general electrode problems, (2) methods of minimizing these problems, and (3) specific applications to bioelectric measurements. (Author)

AD-267 093 Div. 16
(TIPTB/CW) OTS price $1.60

Johns Hopkins U., Baltimore, Md.
(No title).
Final technical rept.,
by Vernon B. Mountcastle. 1961, 12p. incl. table.
(Contract AF 49(638)499)
(AFOSR-1691) Unclassified report

DESCRIPTORS: (*Cerebral cortex, *Nerves, Stimulation, Sensory perception, Pain, Physiology, Measurement.) Laboratory animals, Data processing systems.

A study of the second somatic area of the cerebral cortex in the cat was made using the method of single unit analysis. Cells of the anterior portion of this area possess properties that are lemniscal in nature, resembling those of the first somatic area. Cells of more posterior parts of this area possess properties similar to those of the posterior nuclear group of the thalamus; they are neither mode nor place specific; and auditory and somatic inputs interact upon them. Clear evidence was obtained that the somatic sub-mode of pain projects upon the second somatic area. Part of the study dealt with the design and construction of an automatic data-reducing system for neurophysiological investigations. The system allows automatic measurement of intervals between nerve impulses, preserves the temporal order of the data, labels each interval measured in re its relation to sensory stimuli, and presents data readout ready for computer input. (Author)

17. METALLURGY

AD-266 140 Div. 17, 26
(TIPTM/BRW) OTS price $1.60

Republic Steel Corp., Canton, Ohio.
EVALUATION OF THE PRODUCIBILITY OF TWO NEW TITANIUM BASE SHEET ALLOYS, Ti-7Al-12Zr AND i-5Al-5ZR-5Sn.
Bimonthly rept. no. 9, 1 July-31 Aug 61, by M. Scott and T. Vretas. 6 Sep 61, 15p. incl. illus. tables.
(Contract NOa(s) 60-6035-c)
Unclassified report

DESCRIPTORS: (*Sheets, *Titanium alloys, Aluminum alloys, Zirconium alloys, Tin alloys, Heat treatment, Heating, Air cooled, Cooling, Phase transitions, Mechanical properties, Microstructure, Grains (Metallurgy).) (Production, Processing, Rolling mills, Pickling, Abrasive blasting machines, Surface properties, Contamination, Hydrogen.) (Vacuum furnaces, Heat treatment, Salts, Sodium compounds, Hydrides.)

A study was made of the effect of cooling rate upon mechanical properties of the Ti-7Al-12Zr alloy. Test results showed that slow cooling from 1650, 1550, 1525, and 1100 F developed low tensile ductility and high minimum bend radius (MBR) values, but no appreciable change in tensile or yield strength values. Removal of 0.006 in. appeared to restore tensile ductility but not MBR values. Reheating slow cooled sheet product to 1550 F for 45 min and air cooling restored original MBR values to 4.0 to 5.5T. Microstructure examination of material as mill processed and that reannealed at 1550 F showed a significant difference in grain structure. Electron microscope examination of the grain boundaries did not reveal any precipitate which could account for the poor ductility. (Author)

AD-266 150 Div. 17
(TIPTM/BRW) OTS price $1.60

Research Chemicals, Inc., Burbank, Calif.
RARE EARTH INTERMETALLICS.
Bimonthly rept. no. 2, 15 Jan-15 Mar 61. 15 Mar 61, 10p. incl. illus. tables (Rept. no. RC-173)
(Contract NOw 61-0257-c)
Unclassified report

DESCRIPTORS: (*Intermetallic compounds, *Rare earth elements, Hafnium, Rhenium, Dysprosium, Boron, Boron alloys, Hafnium alloys, Rhenium alloys.) (Corrosion inhibition, Coatings, Refractory coatings.) (Yttrium, Phosphorus alloys.)

Intermetallics in the Hf-Re system had corrosion rates greater than pure Hf. Alloys containing more than 10% Re all lost weight at the 1000 C test temperature. Corrosion rate data in the Hf-Dy system are presented in tabular form. The rate is apparently proportional to the Dy content. The data in the Hf-B system are of considerable interest. Although arc melting procedures did not produce intermetallics of the desired B content, nevertheless the results indicate a considerable decrease in corrosion rates due to the formation of a hafnium boride. Preliminary experiments were conducted with intermetallics of the rare earths with phosphorus. A preliminary check in the Yt-P system shows considerable improvement in corrosion resistance. (Author)

AD-266 155 Div. 17
(TIPTP/MFS) OTS price $1.60

Sylvania Electric Products, Inc., Towanda, Pa.
DEVELOPMENT AND PRODUCTION OF IMPROVED MOLYBDENUM SHEET BY POWDER METALLURGY TECHNIQUES.
Interim rept. no. 9, 1 Apr-31 May 61, by Russell C. Nelson, Roger B. Bargainnier, and Lauri D. Tiala. 14 July 61, 14p. incl. illus. tables.
(Contract NOa(s)660-6018-c)
Unclassified report

DESCRIPTORS: (*Powder metallurgy, Powder alloys, *Molybdenum, Titanium, *Sheets.) (Processing, Physical properties, Mechanical properties, Sintering, Crystallization, Tensile properties, Phase transitions.) (High temperature research, Experimental data, Tables.)

Evaluation of 3 commerical arc-cast alloys revealed an outstanding powder-metallurgy alloy, namely, Mo-0.5Ti-0.046C prepared by sintering at 2150 C in a dissociated-ammonia atmosphere. The alloy combines excellent high-temperature properties and strength-to-weight ratio with good rollability. It is superior to its compositional counterpart sintered at 1800 C in hydrogen and to arc-cast Mo-0.5Ti. To investigate this alloy further, a new series of rolling slabs was prepared and sintered at about 2150 C under both dissociated-ammonia and hydrogen atmospheres. (Author)

AD-266 175 Div. 17
(TIPTM/GEL) OTS price $2.60

Snell, Foster D., Inc., New York.
DEVELOPMENT OF ULTRA-THIN FILM PRESERVATIVE COMPOUNDS.
Quarterly rept. no. 1, 6 June-30 Sep 61, by William Miglas and Bernard Berkeley. 26 Oct 61, 18p. illus. 12 refs.
(Contract Now 61-0855)
Unclassified report

DESCRIPTORS: *Corrosion inhibition, *Thin films, Condensation, Additives, *Coatings, Metal coatings, Organic coatings, Metals, Preservation, Lubricants, Solutions, Tests, Test methods, Temperature, Humidity, Controlled atmospheres.

An investigation was begun to develop a preservative compound which will (1) afford a high degree of protection to metal surfaces, (2) will not interfere with normal or dry-film lubrication, and (3) will be applicable from quick-drying, non-toxic solvents. Commonly used test methods such as the JAN-H-792 humidity cabinet test, salt spray test, and fog cabinet test are often the basis for claims of effective corrosion control materials and methods. Lack of correlation with field tests and poor reproducibility of results are encountered with many tests. The literature review indicated that there were no effective corrosion preventive compounds which function as ultra-thin films applied from dilute solutions. (Author)

AD-266 177 Div. 17, 26
(TIPTM/BRW) OTS price $1.60

Sylvania Electric Products, Inc., Towanda, Pa.
DEVELOPMENT AND PRODUCTION OF IMPROVED MOLYBDENUM SHEET BY POWDER METALLURGY TECHNIQUES.
Interim rept. no. 10, 1 June-31 July 61, by Russell C. Nelson and Roger B. Bargainnier.

2 Oct 61, 10p. illus. tables.
(Contract NOa(s) 60-6018-c)
Unclassified report

DESCRIPTORS: (*Sheets, *Molybdenum, *Molybdenum alloys, Titanium alloys, Zirconium alloys, Carbon alloys, Production, Processing, Casting, Powder metallurgy, Hydraulic presses, Hydrostatic pressure, Sintering, Controlled atmospheres, Hydrogen, Ammonia, Hydrides.) (Physical properties, Density, Grains (Metallurgy).) (Rolling mills, (Fracture (Mechanics).)

The processing of 32 rolling slabs from the Mo, Mo-Ti, Mo-Ti-C and Mo-Ti Zr-C systems sintered at 2150 C in either H or dissociated NH3 is described. An analysis of the sintering data is presented. The sintered properties of a given composition were found to be similar regardless of sintering atmosphere. The density and grain count of Mo and Mo-Ti slabs and of Mo-Ti-C and Mo-Ti-Zr-C slabs were comparable. Carbon additions coarsened the sintered structure and lowered the density. The Mo-Ti and Mo-Ti-C slabs rolled satisfactorily. However, sheet of the latter composition incurred more edge-cracking. The Mo-Ti-Zr-C slabs failed catastrophically. (Author)

AD-266 183 Div. 17, 26
(TIPTP/MFA) OTS price $9.10

Sylvania Electric Products, Inc., Towanda, Pa.
DEVELOPMENT AND PRODUCTION OF IMPROVED MOLYBDENUM SHEET BY POWDER METALLURGY TECHNIQUES.
Final rept. on Powder Rolling of Molybdenum Sheet,
by Charles Wurms and Robert Steinitz. 31 Mar 61, 99p. incl. illus. tables.
(Contract NOa(s) 60-6018-c)
Unclassified report

DESCRIPTORS: (*Molybdenum, *Molybdenum alloys, *Sheets, *Powder metallurgy, Rolling mills, Processing.) (Tensile properties, Mechanical properties, Sintering, Deformation, Density, Temperature, Chemical analysis.) (Photographic analysis, Grains (Metallurgy).) Tables.

A feasibility study of producing thin molybdenum sheet by powder rolling was performed, as part of a more comprehensive investigation on the production of improved molybdenum sheet by powder-metallurgy techniques. Green sheet of 40 to 45-mil thickness could readily be produced, using the equipment available. The green sheet was then sintered, compacted to full density by hot rolling, and reduced by hot and cold rolling to the final thickness of 10 mils. Process variables and their effect on properties were studied. Recommendations and tentative specifications for the selection of powder raw materials and processing procedures have been written. The possibility of a scale-up of the process for wider and heavier sheet is discussed and an estimate of the necessary man-hours to produce 50 lb of material is included. (Author)

AD-266 212 Div. 17, 26
(TIPTM/BRW) OTS price $4.60

Westinghouse Electric Corp., Blairsville, Pa.
MOLYBDENUM FORGING PROCESS DEVELOPMENT.
Interim technical progress rept. no. 5, 15 June-15 Sep 61,
by J. Bonchak. 15 Sep 61, 40p. illus.
(Contract AF 33(600)41419, Proj. 7-756)
(ASC TR 7-756(V)) Unclassified report

DESCRIPTORS: (*Molybdenum alloys, Manufacturing methods, Processing, *Forging, Deformation, Plastic flow, Surface properties, Physical properties, Density, Grains (Metallurgy), Crystal structure, Dies, Lubricants, Graphite, Molybdenum compounds, Sulfides, Coatings, Glass.) (Heating, Heat treatment, Stresses, Deformation, Sensitivity, Fracture (Mechanics).)

Hot-worked Ti-Zr-Mo (TZM) alloy blanks were contour forged to investigate the effects of forging variables on metal flow, surface quality, and soundness in the workpiece. The variables investigated were die temperature, die lubricants, coatings, and rate of reduction. Of these the rate of reduction was found to be of most importance to the process. A proper rate of reduction of the hot-worked structure is mandatory to prevention of stress cracking during or after forging in the cold work range. The sensitivity to reduction rates can be lessened in hot-worked TZM alloy by: (1) heat treatment prior to initiating cold-work; (2) employing higher cold work temperatures; and (3) intermediate heat treatments after given amounts of cold work. (Author)

AD-266 221 Div. 17, 26
TIPTM/BRW) OTS price $1.60

Solar Aircraft Co., San Diego, Calif.
DEVELOPMENT OF LOW TEMPERATURE BRAZING OF TUNGSTEN FOR HIGH TEMPERATURE SERVICE.
Interim rept. no. 3, 16 July-15 Sep 61.
16 Oct 61, 12p. incl. tables (Rept. no. RDR 1249-3)
(Contract NOw 61-0414-c)
Unclassified report

DESCRIPTORS: (Refractory materials, *Tungsten, *Brazing, Soldering alloys, Platinum alloys, Boron alloys, Powder alloys, Low temperature research.) (Welded joints, Metal joints, Brazing, Diffusion, Heat treatment, Melting, Additives of Powder metals, Tungsten.) (Iridium alloys, Boron alloys.)

Tungsten specimens were brazed and diffused for 3 hr at 2000 F with the Pt-B alloys plus 11.1% W powder additions. The joints brazed with the Pt-3.6B alloy yielded remelt temperatures of 3930 F under a 21.5 psi stress. Specimens brazed with Ir-B alloys (no W powder additions) and diffused for 3 hr at 2000 F have also given remelt temperatures as high as 3930 F under a 21.5 psi. (Author)

AD-266 233 Div. 17
(TIPTM/TCG) OTS price $1.10

Chicago Development Corp., Riverdale, Md.
MATERIALS AND SERVICES NECESSARY FOR AN INVESTIGATION OF THE EFFECT OF MECHANICAL PROPERTIES ON THE METHOD OF ADDITION OF IRON TO ELECTROLYTICALLY PRODUCED TITANIUM.
Progress rept. 1 Jan-28 Feb 61,
by R. S. Dean, W. W. Gullett and R. E. Brown.
28 Feb 61, 3p. incl. illus. table.
(Contract NOw 60-0164-c)
Unclassified report

DESCRIPTORS: (Electrolytic cells, Production of *Titanium, *Crystals with Iron, Additives, Metallurgical analysis, Microstructure, Mechanical properties, Magnetic properties.) (Melting, Precipitation, Transformations, Solids, *Titanium alloys, Iron alloys, Heat treatment.) Materials, Phase transitions.

Metallographic study of samples of buttons made from Fe containing Ti crystals, revealed that in all samples showing high remanent magnetism and high apparent tensile modulus, a typical structure appeared on metallographic examination of polished and etched specimens. This structure might be classed as similar to a Widmanstattian structure and presumably arises from the precipitation of the alpha Ti along a particular habit plane of the beta Ti from which it is formed. The precise mechanism of solidification and transformation which is thus favored by alpha Ti-iron clusters which persist through the button melting is not clear. The samples which show the Widmanstattian type structure do not show it uniformly but rather in patches. A 300-lb ingot of electroytic Ti containing Fe was made. In order to study the cold worked properties of the ingot, turnings were made from the circumference of the ingot and cold rolled. A comparison of the load-extension curves of the cold rolled turnings and the forged and annealed bar showed that the turnings had a much higher apparent modulus. (Author)

AD-266 265 Div. 17, 26
(TIPTM/BRW) OTS price $3.60

Propellex Chemical Div., Chromalloy Corp., Edwardsville, Ill.
A STUDY OF EXPLOSIVE FORMING SELECTED REFRACTORY METALS.
Progress rept. no. 2, 1 July-31 Aug 61. 15 Sep 61, 21p. illus.
(Contract NOw 61-0832-c)
Unclassified report

DESCRIPTORS: (Heat resistant alloys, *Refractory materials, *Explosive forming, Molybdenum alloys, Tungsten alloys, Titanium alloys, Niobium alloys, Dies, Deformation, Heat transfer.)

Progress is reported on an investigation of explosive forming of selected refractory metals to optimize the strain rate conditions and the most suitable transmission media for achieving maximum formability as well as a determination of the effects of temperature up to a maximum of 1000 F. Basic materials to be investigated include (1) arc cast Mo--1/2% Ti, (2) W, (3) Nb alloy (Cb-74) and (4) Nb alloy (CT-2WZ). (Author)

AD-266 270 Div. 17, 25
(TIPTM/GEC) OTS price $2.60

Denver Research Inst., Colo.
A FUNDAMENTAL INVESTIGATION OF THE ALLOYING BEHAVIOR OF THE RARE EARTHS AND RELATED METALS.
Semi-annual progress rept. no. 4, 1 May-31 Oct 61,
by Albert S. Yamamoto, Charles E. Lundin, and Joseph F. Nachman. Nov 61, 18p. incl. illus. tables.
(Contract AF 33(616)6787), Proj. 7021)
Unclassified report

DESCRIPTORS: (*Alloys, *Rare earth elements, *Praseodymium, *Neodymium.) (Vaporization, Vapor pressure, Phase studies, Solubility, Low temperature research, High temperature research, Density.)

The vapor pressures of the rare-earth metals, Pr and Nd, were determined in the temperature range of 1724 to 1874K and 1638 to 1791K, respectively, by the Knudsen effusion method. The heats of vaporization of Pr and Nd, respectively, as calculated from the slopes of the vapor-pressure plots, are delta H sub V equals 84.42 + or - 1.94 kcal/mole and 84.06 + or - 2.21 kcal/mole. A tentative phase diagram for the binary system Pr-Nd, was established by room-temperature metallography and thermal analysis. Complete solid solubility in both the low-temperature and high-temperature phases occurs. The densities of a series of alloys were determined by the displacement method at room temperature. A plot of molal volume of solution versus mole fraction indicates that the solution approaches ideality. The Knudsen effusion study of activities of alloys of Pr and Nd is currently in progress. (Author)

AD-266 278 Div. 17, 26
(TIPTB/LH) OTS price $1.10

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
FABRICATION OF INTERNALLY STIFFENED TITANIUM CYLINDERS.
Interim progress rept. no. 6, 1 July-1 Sep 61, by E. W. Moles. 1 Oct 61, 8p. incl. illus.
(Contract NOw 60-0173-c)
Unclassified report

DESCRIPTORS: (*Stiffened cylinders, *Titanium alloys, Production, Manufacturing methods.) (Metal plates, Processing, Extrusion, Rolling mills, Machining, Welding, Electrical welding, Cutting torches, Hardness, Microstructure, Measurement.) (Stiffened cylinders, Chemical analysis, Tensile properties, Mechanical properties.)

AD-266 280 Div. 17, 25
(TIPTM/GEC) OTS price $1.10

Illinois U. Coll. of Engineering, Urbana.
STUDY OF THE ALLOYS OF TRANSITION ELEMENTS.
Final rept. 1953-1961,
by Paul A. Beck. 1961, 7p. 23 refs.
(Contract DA 11-022-ORD-1175, Proj. TB 2-0001(618))
(AROD rept. no. 618:23)
Unclassified report

DESCRIPTORS: (*Transition elements, *Alloys, Low temperature research, High temperature research, *Phase studies, Phase transitions, Physical properties, Theory.) (Vanadium alloys, Manganese alloys, Iron alloys, Cobalt alloys, Nickel alloys.) (Chromium alloys, Manganese alloys, Iron alloys, Cobalt alloys, Nickel alloys.) (Niobium alloys, Aluminum alloys.) (Molybdenum alloys, Manganese alloys, Cobalt alloys.) (Chromium alloys, Molybdenum alloys, Cobalt alloys.) (Titanium alloys, Manganese alloys.) (Silicones, Stability.)

Efforts were devoted to the investigation of the occurrence and composition ranges of various intermediate phases in binary and ternary alloys of transition elements, concentrating on phase diagrams. Quantitative information was also gathered on the physical properties of these alloys such as magnetic susceptibility, saturation moment, low- and high-temperature specific heat, and electrical resistivity.

AD-266 325 Div. 17, 25
(TIPTP/MFA) OTS price $1.60

Israel Inst. of Tech., Haifa.
INHOMOGENEOUS ORDERING DUE TO EXCESS VACANCIES: AN ORDER-STRENGTHENING MECHANISM,
by P. S. Rudman. June 61, 12p. illus.
(Scientific note no. 6)
(Contract AF 61(052)122)
(ARL-172) Unclassified report

DESCRIPTORS: (*Alloys, Physical properties, Mechanical properties, Crystals, Deformation, Plastic flow, *Crystal structure, Lattices, Stresses.) (Equations, Motion, Integration.)

It is noted that quenched-in excess vacancies decay more rapidly in the vicinity of dislocations and this gives rise to a lower long-range ordering rate near dislocations. It is shown that in partially ordered systems, dislocations will be locked-in by an order gradient and that a yield point is to be expected. The magnitude of the effect is calculated for beta brass on the basis of quasi-chemical binding and a yield stress comparable with the observed is obtained. It is also shown that this model of inhomogeneous ordering yields a simple explanation of an anomalous resistivity effect observed in Cu3Au. (Author)

AD-266 330 Div. 17
(TIPTM/EJH) OTS price $3.00

Westinghouse Electric Corp., Bloomfield, N. J.
PHYSICAL METALLURGY OF TUNGSTEN AND TUNGSTEN BASE ALLOYS.
Rept. for 1 Feb 60-31 Jan 61, on Metallic Materials,
by Heinz G. Sell, George H. Keith and others.
May 61, 143p. incl. illus. tables.
(Contract AF 33(616)6933, Proj. 7351; Continuation of Contract AF 33(616)5632)
(WADD TR 60-37, pt. 2)
Unclassified report

DESCRIPTORS: (*Tungsten, *Powder metals, Crystals, Single crystals, Growth, Zone melting, Chemical impurities, Purification, Transition temperatures, Elasticity, Atomic structure.) (Laboratory furnaces, Electron beams.) (*Tungsten alloys, *Powder alloys, *Heat resistant alloys, Crystallization, Chemical analysis, Creep, Rupture.) (High temperature research, Powder metallurgy, Mechanical properties, Tensile properties, Fracture (Mechanics), Processing, Heat treatment, Manufacturing methods, Microstructure, Lattices, Impurities.)

Fundamental properties of high purity w produced both by powder metallurgy techniques and, as single crystals, by electron beam zone melting were studied. High temperature properties of several dispersed second-phase w base alloys were also investigated. Base line data on the metallurgical properties of pure w for temperatures above 2500 F were obtained. The mechanism of purification in w during zone melting was studied. The flow and fracture characteristics of w single crystal were investigated as functions of annealing temperature and atmosphere. Internal friction measurements were carried out at 20 to 800 C on high purity and dosed polycrystalline w wires and w single crystals. (Author)

AD-266 331 Div. 17
(TIPTP/MFA) OTS price $3.60

Israel Inst. of Tech., Haifa.
LONG-RANGE ORDER IN Fe-Al ALLOYS. III. A RESISTOMETRIC STUDY OF ORDERING KINETICS IN Fe3Al,
by Judith Bransky and P. S. Rudman. June 61, 19p. illus. (Scientific note no. 5)
(Contract AF 61(052)122)
(ARL-160) Unclassified report

DESCRIPTORS: (*Alloys, *Iron, *Aluminum, Crystal structure, Mechanical properties, Deformation, Resistance, Transformations, Temperature, Heat treatment, Grains, Elastic scattering.) (Experimental data, Equations.)

The ordering kinetics of the transformation FeAl order to Fe3Al order have been resistometrically studied for nearly stoichiometric Fe3Al. The ordering rate has been found to depend on the temperature of prior quenching and on the degree of cold work. The results have been satisfactorily analyzed in terms of an excess quenched-in vacancy concentration that decays exponentially with time. The vacancy lifetimes at 260 C were found to vary from 10 minutes to 650 minutes as the degree of recrystallization increased. A ten-fold reduction in the time to complete ordering was obtained by increasing the quenching temperature from 600 C to 900 C. An activation energy for vacancy formation of 0.75 ev was obtained. (Author)

AD-266 332 Div. 17
(TIPTP/MFA) OTS price $2.60

Israel Inst. of Tech., Haifa.
THEORY OF VACANCY MECHANISM ORDER-DISORDER KINETICS,
by P. S. Rudman. May 61, 18p. illus. (Scientific note no. 4)
(Contract AF 61(052)122)
(ARL-164) Unclassified report

DESCRIPTORS: (*Crystal structure, Heat treatment, *Mechanical properties, Transformation, Lattices, Physical properties, Resistance, *Alloys, Iron, Aluminum, Copper, Zinc.) (Equations, Integration.)

The order-disorder kinetics of the structures CuZn, Cu3Au, and Fe3Al is considered in terms of a vacancy mechanism. The unit ordering process is required to be consistent with the macroscopic definition of a change in long-range order and is thus taken to be a simultaneous jumping of an A atom into an alpha site and a B atom into a beta site. A rate equation formally similar to those obtained by Dienes and by Vineyard for the direct interchange mechanism is obtained. The rate constants are evaluated by assuming the zeroth order quasi-chemical approximation. Particular attention is given to the Fe3Al structure because of its uniqueness in exhibiting an ordering of second neighbors and its not being considered by previous treatments. The analysis of order-disorder kinetics data to obtain activation energies of vacancy formation and migration is considered in the light of the present results. (Author)

AD-266 346 Div. 17
(TIPTM/EJH) OTS price $3.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
COMMENTS ON CERTAIN INVESTIGATIONS RELATING TO

HIGH-STRESS-LOW CYCLE FATIGUE.
Rept. for June 58-Dec 60 on Mechanics of Flight, by S. R. Valluri. July 61, 31p. incl. illus. 81 refs.
(Contract AF 33(616)5740, Proj. 7063)
(ARL-23) Unclassified report

DESCRIPTORS: (*Metals, *Alloys, *Fatigue (Mechanics), *Failure (Mechanics), Fracture (Mechanics), Deformation, Plasticity, Stresses, Mathematical analysis, Differential equations, Theory.) (*Bibliography, Fatigue (Mechanics).)

A review of the recent publications in the field of high stress - low cycle - fatigue is made, and several of the empirical relations proposed are compared. It is found that basically high stress level fatigue is characteristically similar to failure under static conditions. An inquiry is made into the essential requirements of any investigation concerned with the problem of high stress devel fatigue. These are: (1) the rate and extent of crack propagation during progressive cycling; (2) the extent of the area of plastic deformation; (3) the changes of this plastic enclave during progressive cycling; and (4) the hysteresis loop for every element of this plastic enclave as it progresses during the progression of the crack due to repeated loading. Possible means of investigating these 4 items were analyzed and recommendations were made for lines of further study. (Author)

AD-266 347 Div. 17
(TIPTM/EJH) OTS price $4.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
THE EXTENT OF ELASTO-PLASTIC YIELDING AT THE CRACK POINT OF AN EXTERNALLY NOTCHED PLANE STRESS TENSILE SPECIMEN.
Rept. for June 58-Dec 60 on Mechanics of Flight, by L. D. Stimpson and D. M. Eaton. July 61, 39p. incl. illus.
(Contract AF 33(616)5740, Proj. 7063)
(ARL-24) Unclassified report

DESCRIPTORS: Metals, *Fracture (Mechanics), Failure (Mechanics), Deformation, *Elasticity, *Plasticity, Stresses, Mathematical analysis, Differential equations, Integral equations, Theory.

The results are presented of a relaxational analysis of the elastic and plastic stress fields in an externally notched specimen. Stress distributions in the vicinity of the crack and the plastic enclaves for a sequence of applied loads are given along with numerical data; these are compared to an approximate elastic solution. Taken together, the relaxational and elastic solutions will enable the computation of strains and strain energies leading to a ductile failure criterion. (Author)

AD-266 353 Div. 17, 30
(TIPTM/EJH) OTS price $2.00

Crucible Steel Co. of America, Pittsburgh, Pa.
RESEARCH ON WORKABLE REFRACTORY ALLOYS OF TUNGSTEN, TANTALUM, MOLYBDENUM, AND COLUMBIUM.
Rept. for Jan 59-Jan 61 on Metallic Materials. May 61, 65p. incl. illus. tables.
(Contract AF 33(616)6172, Proj. 7351)
(WADD TR 61-134) Unclassified report

DESCRIPTORS: (*Heat resistant alloys, *Tungsten alloys, *Tantalum alloys, *Molybdenum alloys, *Niobium alloys, Manufacturing methods, Melting, Electric arcs, Extrusion, Forging, Hardening by Deformation, Mechanical properties, Tensile properties, Hardness, Creep.) (Refractory materials, Metals.) (High temperature research, Sheets, Rolling mills, Vacuum furnaces, Test methods, Test equipment.)

Studies were made to determine the potential of the W- and Ta-rich alloys of the W-Ta-Mo-Nb system for high-strength structural applications at temperatures above 2500 F. Twenty specific compositions, including binary, ternary, and quaternary alloys were investigated. Creep and tension tests were conducted on the as-extruded samples at 3000 F in vacuum. The high-temperature strength of the W-rich alloys increased with the addition of Nb, and the high-temperature strength of the Ta-rich alloys increased with additions of Mo and W. 88.6 W - 5.7 Mo - 5.7 Nb alloy had a tensile strength of 62,000 psi at 3000 F; several alloys had tensile strengths in excess of 50,000 psi. These strengths were attained by a combination of solid-solution strengthening and strain hardening. (Author)

AD-266 383 Div. 17, 26
(TIPTM/EJH) OTS price $1.60

Narmco Industries, Inc., San Diego, Calif.
EXO-REACTANT NICKEL BASE STRUCTURAL ADHESIVES.
Quarterly progress rept. no. 3, 1 Sep-1 Oct 61, by Ralph Armstrong. 1 Oct 61, 10p. incl. illus. tables.
(Contract NOw 61-0308-c)
Unclassified report

DESCRIPTORS: (*Stainless steel, Steel, *Nickel alloys, *Cobalt alloys, Heat resistant alloys, *Bonding, Bonded joints, Adhesives, *Soldering fluxes, *Soldering alloys.) (Nickel alloys, Nickel compounds, Fluorides, Oxides and Manganese compounds, Chemical reactions, Oxidation-reduction reactions with Magnesium, Thermochemistry.) Tests, Failure (Mechanics), Microstructure.

A method was developed for bonding stainless steel and Ni and Co base super alloys in air with a Ni alloy by utilizing an exothermic reaction, the products of which provide the braze alloy, flux, and the major part of the heat required. The further development of exotherm compositions and bonding techniques was attempted. The process was improved from the standpoint of reproducibility, and the quality of the bonds fromed; also, a method involving a single technique and exotherm composition that is equally applicable to stainless steel, Co and Ni base super alloys was developed. Ni alloy bonds of Rene 41 were tested in lap shear tensile, with six out of seven specimens tested failing in the base metal. (Author)

AD-266 415 Div. 17
(TIPTM/BRW) OTS price $3.00

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF THE PROPERTIES OF TANTALUM AND ITS ALLOYS.
Rept. for 1 Jan-31 Dec 60 on Metallic Materials, by Frank F. Schmidt, William D. Klopp and others. May 61, 154p. incl. illus. tables, 81 refs.
(Contract AF 33(616)5668, Proj. 7351)
(WADD TR 61-106)
Unclassified report

DESCRIPTORS: (*Tantalum, *Tantalum alloys, Additives effect on Mechanical properties, Oxidation.) (Niobium alloys, Hafnium alloys, Molybdenum alloys, Rhenium alloys, Tungsten alloys, Titanium alloys, Vanadium alloys, Zirconium alloys, Aluminum alloys, Chromium alloys, Beryllium alloys, Silicon alloys.) (Alloys, Crystallization, Transition temperature, Phase transitions, Tensile properties.) (Preparation, Melting, Electron beams, Casting, Rolling mills, Pickling, Contamination, Heat treatment, Hardness.)

Effects of alloying on mechanical properties of Ta were studied. Both dispersion-strengthened and solid-solution strengthened Ta alloys exhibit high-strength at elevated temperatures while maintaining good fabricability and excellent low-temperature ductility. Strength data to 1650 C (3000 F) are reported. The oxidation resistance of Ta can be improved severalfold by alloying. Several alloying elements were found effective in reducing scaling and contamination up to 1400 C (2550 F). (Author)

AD-266 424 Div. 17
(TIPTM/BRW) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF DUCTILE BERYLLIUM COMPOSITES.
Bimonthly rept. no. 5, 18 Sep-17 Nov 61, by Frank A. Crossley and R. J. Van Thyne. 17 Nov 61, 3p. illus. tables (Rept. no. ARF 2212-5)
(Contract NOw 61-0370-c)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, *Silver alloys, Aging, Hardness.) (Powder metals, *Beryllium, Powder alloys, *Beryllium alloys, Silver alloys, Aluminum alloys, Germanium alloys, Deformation, Stresses, Fracture (Mechanics), Heat treatment, Sintering, Binders.) (Mechanical properties, Tensile properties.)

Further efforts directed to the development of ductile composites consisting of Be particles in a ductile matrix of compositions selected from the Al-Ag system are reported. Efforts are being directed toward making relatively large (2 1/2 x 1 1/4 x 1 1/4 in.) compacts from which specimens will be prepared for tensile test evaluation. (Author)

AD-266 469 Div. 17, 14
(TIPTM/GEC) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS ON OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS, by W. D. Klopp. 31 Oct 61, 4p. 14 refs. (DMIC memo. no. 137)
Unclassified report

DESCRIPTORS: (*Antioxidants, *Refractory coatings, Niobium, Molybdenum alloys, Tungsten alloys, Niobium alloys, Tantalum alloys, *High temperature research.) (*Coatings, Silicides, Aluminum coatings.) (Tests, Mechanical properties, Plasticity, Deformation, Fracture (Mechanics), Impact shock.) Tantalum, Molybdenum, Tungsten, Corrosion inhibition.

AD-266 503 Div. 17, 26
(TIPTM/GEC) OTS price $2.60

Fansteel Metallurgical Corp., North Chicago, Ill.
TUNGSTEN SHEET ROLLING PROGRAM.
Interim rept. no. 7, 1 July-31 Oct 61, 8 Nov 61, 13p. incl. illus. tables.
(Contract NOw 60-0621-c)
Unclassified report

DESCRIPTORS: (*Sheets, *Tungsten, *Rolling mills, *Manufacturing methods, Processing, Production.) (*Powder metals, Powder metallurgy, Sintering, Mechanical properties, Physical properties, Tests, Stresses.) (Sheets, Heat treatment, Deformation, Transition temperature.)

Tests showed that cross rolled tungsten sheet has a minimum bend transition temperature of 100 F when stress relieved at 1250 C, 10 minutes at heat. The results of bend tests are given. Preparations were made for sintering and rolling of full size sheets. (Author)

AD-266 541 Div. 17
(TIPTM/EJH) OTS price $10.10

National Electrotechnical Inst. (Italy).
ON THE INFLUENCE OF SMALL AMOUNTS OF IMPURITIES ON RECRYSTALLIZATION AND GRAIN GROWTH OF HIGH PURITY IRON. NOTE I. EFFECT OF INTERSTITIAL CARBON AND EFFECT OF PRECIPITATED OXIDE IMPURITIES.
Final technical rept., 10 Oct 60-30 Sep 61, by Giovanni Venturello, F. Bonaccorso and G. Della Gatta. Oct 61, 127p. incl. illus. tables, 84 refs.
(Contract DA 91-591-EUC-1542)
Unclassified report

DESCRIPTORS: (*Iron, Preparation, Processing, Heat treatment, Sintering, Chemical impurities, Oxides, Carbon, *Crystallization, Mechanical properties, Hardness, Grains (Metallurgy), Crystals, Growth, Temperature.) (Purification, Ion exchange resins.) (Microstructure, X-ray diffraction analysis.)

A study was made of the effect of small amounts of impurities on recrystallization of Fe and related effects of recovery and grain growth. Methods of preparation of high purity Fe were studied. Some pure Fe specimens were carburized at 700 C with increasing amounts of C added to the H2. These, together with other specimens of Fe of different purity, were cold worked in different amounts and the recovery and recrystallization were followed by hardness, micrographs and x rays. In pure Fe, recovery effects and recrystallization were observed much before the less pure specimens. The effect of C appears small in comparison with the effects of some substitutional elements. Preliminary measurements of grain boundary internal friction of pure Fe with different C content were performed. Displacement of the grain boundary peak was consistent with the recrystallization temperature.

AD-266 543 Div. 17
(TIPTB/MS) OTS price $3.60

Committee on Ship Structure, National Research Council, Washington, D. C.
LOW-CYCLE FATIGUE OF METALS. LITERATURE REVIEW.
Progress rept. no. 1,

by J. T. P. Yao and W. H. Munse. 31 Oct 61, 61p. incl. illus., 69 refs. (Rept. no. SSC-137)
(Contracts NObs-77008 and NObs-72046)
Unclassified report

DESCRIPTORS: *Metals, *Fatigue (Mechanics), Stresses, Tests, Bibliography.

Evaluation of data on low-cycle fatigue of metals based on type of test, cyclic rate, stress concentration, crack propagation, material property change and method of analysis indicates that (a) there is presently no general analysis applicable to all low-cycle fatigue test conditions; (b) the shape of the load-time curve is important in analyzing low-cycle fatigue test; (c) the extent of the time effect on low-cycle fatigue behavior, particularly with respect to creep and crack propagation, remains to be explored; (d) use of strain rather than stress is more desirable in low-cycle fatigue studies of coupon-type specimens because of the plastic deformation that takes place during such tests; and (e) the fatigue hypotheses based on strain, although developed from limited data, exhibit good agreement with the test results and show promise of providing a good indication of low-cycle fatigue behavior for selected loading conditions. (Author)

AD-266 556 Div. 17, 1, 12, 9
(TIPTA/LSK) OTS price $10.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
FACTOR OF SAFETY CONSIDERATIONS FOR AERODYNAMICALLY HEATED STRUCTURES SUBJECTED TO HIGH CYCLIC STRESSES.
Final rept. 1 Mar-31 Aug 61,
by E. H. Nickell and W. E. Jacobsen. Oct 61, 121p. incl. illus. tables (Rept. no. IMSC 2-04-61-1)
(Contract AF 33(616)8000, Proj. 1367)
(ASD TR 61-508)
Unclassified report

DESCRIPTORS: (Space ships, Re-entry vehicles, Hypervelocity vehicles, *Airframes, *Structures, Materials, Alloys, Steel, Stainless steels, Aluminum alloys, Space flight, Space environmental conditions, Safety, Hypersonics, Re-entry aerodynamics, Aerodynamic heating, Thermal stresses, Stresses, Load distribution, Fatigue (Mechanics), Failure (Mechanics), Physical properties, Mechanical properties, Mathematical prediction, Mathematical analysis, Theory, Test methods, Tests.)

A parametric study was made from published low-cycle fatigue data showing the various effects on cycles-to-failure. Included are uniaxial and biaxial experimental results. True total strain range, ratio of minimum-to-maximum strain, and effects of geometry are the predominate parameters affecting fatigue life for mechanical cycling at room and elevated temperatures. Structural life was investigated in terms of the parameters for mechanical cyclic loading as well as for cyclic thermal straining. In the former case, expressions relating the parameters to structural life were found. However, in the latter case, no reliable expression between these parameters and structural life was found. A specific expression for conservatively predicting structural life or endurance is developed and applies to all materials, ratios of minimum-to-maximum strains, temperatures, and states of stress. Also considered were single-cycle failures resulting from thermal shock. (Author)

AD-266 558 Div. 17, 2, 20
(TIPTB/MS) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPUTTERING. A BIBLIOGRAPHY OF THEORY AND EXPERIMENTAL RESULTS.
Addendum to the Space Materials Handbook, comp. by W. L. Hollister. Aug 61, 28p. 60 refs. (Rept. no. 3-34-61-10; Special bibliography no. SB-61-47)
(Contract AF 04(647)673)
Unclassified report

DESCRIPTORS: (*Bibliography, *Metals, Spaceships.) (*Atmospherics, *Ion bombardment, Measurement.) (Metals, Particles, Theory.)

Originally this search was made to collect information on the effects of sputtering on the surface properties of materials used in space vehicles. Since in this area the literature is limited, the search was expanded to include any reference related to sputtering. The types of sputtering included are cathode, ion, and particle. Sputtering as a means of depositing thin films of metals was not included. This bibliography reflects the holdings of the Technical Information Center, Lockheed Missiles & Space Company. (Author)

AD-266 590 Div. 17
(TIPTM/GEC) OTS price $2.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
A STUDY OF THE SHORT TIME ELEVATED TEMPERATURE PROPERTIES OF CLAD X2020-T6 AND 7075-T6 ALUMINUM ALLOY SHEET.
by Robert G. Mahorter, Jr. 25 Sep 61, 29p. incl. illus. tables (Rept. no. NAMC-AML-1291)
Unclassified report

DESCRIPTORS: (*Aluminum alloys, *Sheets, Temperature, Mechanical properties, Stresses, Tensile properties, Tests, Heating, Thermal stresses.) (Airframes, Nuclear weapons, Blast.)

Short exposure time tensile tests were performed on clad 7075-T6 and clad X2020-T6 aluminum sheet. The exposure temperatures used were 300 F, 350 F, 400 F, 450 F, and 500 F. The exposure times were 3, 10, 30, 60, and 600 seconds. Specimens were tested at temperature and at room temperature after exposure. The strain rates used were 0.002 and 0.054 inches per inch per minute. (Author)

AD-266 607 Div. 17
(TIPTM/TCG) OTS price $9.10

Naval Ordnance Lab., White Oak, Md.
THE PROPERTIES OF TiNi AND ASSOCIATED PHASES,
by W. J. Buehler and R. C. Wiley. 3 Aug 61, 91p. incl. illus. tables, 21 refs. (Rept. no. NOLTR 61-75)
Unclassified report

DESCRIPTORS: (Intermetallic compounds, *Titanium alloys, *Nickel alloys, X-ray diffraction analysis, Electrical properties, Resistance, Friction, Metallurgical analysis, Magnetic susceptibility, Measurement.) (Mechanical properties, Tensile properties, Hardness, Damping, Heat treatment, Welding, Corrosion.) (Phase studies, Crystallization, Grains (Metallurgy).) Corrosion resistant alloys, Melting, Laboratory furnaces.

A new class of alloys based on the ductile intermetallic compound TiNi and associated phases Ti2Ni, TiNi3 was investigated. The most phase-pure TiNi composition was found at about 54.5 wt-% Ni. This composition (body-centered cubic crystal structure) possessed good room temperature ductility and a moderately high melting point, about 1300 C. The room temperature mechanical properties of the pure TiNi phase (hot worked) indicated a maximum ductility of 15% tensile elongation and up to 28 ft-lbs impact strength. An ultimate tensile strength of 124,000 psi was also measured. TiNi appears to have usable strength up to about 649 C. TiNi-base alloys, with excess Ni added, were capable of being hardened by quenching. Quenched hardnesses as high as 62 Rockwell C were obtained. They showed a marked improvement in hot hardness over the predominantly phase-pure TiNi at temperatures up to 482 C. (Author)

AD-266 670 Div. 17, 25
(TIPTM/EJH) OTS price $2.60

Stanford U., Calif.
ELASTIC PROPERTIES RESEARCH.
Progress rept. no. 4, 1 Apr-30 Sep 61,
by J. L. Lytton, J. A. Hren and others.
30 Sep 61, 16p. illus.
(Contract AF 33(616)6789)
Unclassified report

DESCRIPTORS: (*Metals, *Alloys, *Ferromagnetic materials, Sheets, Ferromagnetism, *Elasticity, Plasticity, Deformation, Crystals, Single crystals, Grains (Metallurgy), Lattices, Relaxation time, Damping, High temperature research.) (Iron alloys, Silicon alloys.) (Iron alloys, Aluminum alloys.) (Nickel, Cobalt.) (Iron, Iron alloys, Diffusion.)

The dynamic modulus (at about 300 c) and plastic properties of an Fe-3% Si oriented transformer sheet were studied in the temperature range 25 to 1200 C. A large anisotropy in elastic properties was obtained at room temperature. The strong anisotropy persisted as a function of temperature. An anomalous decrease in elastic modulus in the range 600 to 750 C is being attributed to possible loss in ferromagnetism. The role of disordering on the elastic properties of an Fe3Al alloy was completed. Both dynamic modulus and damping capacity measurements were made in the temperature range 25 to 900 C. Five specific elastic and anelastic characteristics were identified. The role of ferromagnetism on the elastic properties of Ni and Co was evaluated. (Author)

AD-266 687 Div. 17, 26
(TIPTM/GEC) OTS price $10.50

United States Steel Corp., Pittsburgh, Pa.
SANDWICH ROLLED WIDE STEEL SHEETS.
Final technical engineering rept. June 59-May 61,
by James J. Heger and Edward L. Fogleman.
Oct 61, 42p. illus. tables.
(Contract AF 33(600)38482)
(ASD TR 61-7-762) Unclassified report

DESCRIPTORS: (*Sheets, Steel, Stainless steel, Rolling mills, Metal plates, *Manufacturing methods, Production, Processing, Precision finishing, Quality control, Thickness, Heat treatment.)

Sandwich rolling provides alloy and stainless steel sheets in sizes and thicknesses previously unattainable. Sheets, 125 in. in width and 240 in. in length, were produced in thicknesses of 0.030 to approximately 0.100 in. on conventional plate mill facilities. The construction of a sandwich pack assembly involves enveloping a number of alloy or stainless core plates with carbon steel cover plates to produce a laminated slab, processed as a single assembly. The use of plate mill facilities makes it possible to produce wide sheets and minimize end-to-end thickness variations and crown by cross rolling. Better sheet thickness controls are established through the simultaneous reduction of a multiple number of plates since any variation from the desired hot rolled finishing thickness is only fractionally distributed to each sheet. By heating and soaking the core plates prior to rolling and by subsequently annealing the sheets while within the carbon envelope, the need for a protective atmosphere to minimize decarburization is eliminated. (Author)

AD-266 713 Div. 17,
(TIPTM/BRW) OTS price $7.60

Wah Chang Corp., Albany, Oreg.
TUNGSTEN EXTRUSION PROGRAM.
Interim technical rept. no. 2, 10 Apr-24 Aug 61,
by A. E. Riesen and James Wong. 24 Aug 61, 61p. incl. illus. tables.
(Contract AF 33(600)42395, Proj. 7-793)
Unclassified report

DESCRIPTORS: (*Tungsten, *Tungsten alloys, Molybdenum alloys, *Extrusion, Production, Processing.) (Powder metals, Powder metallurgy, Hydroforming, Sintering, Resistance.) (Electrodes, Electron beams, Electric arcs, Melting, Vacuum furnaces, Controlled atmospheres, Hydrogen, Magnetic fields, Stirrers.) (Castings, Chemical analysis, Carbon, Nitrogen, Oxygen, Nondestructive testing, Ultrasonics, Containers, Steel, Heat treatment, Extrusion.) (Dies, Coatings, Zirconium compounds, Dioxides, Lubricants, Glass.)

Ingots of W-3% Mo alloy were arc-melted by various electrode preparation techniques, melt rates and crucible sizes to optimize as-cast ingot quality. Ingots were evaluated for purity, soundness, structure and sidewall cleanup. Preliminary extrusions were made with two 6.55-in.-diam. billets at 2.8:1 reduction ratio and 3.725-in.-diam. billets at 11:1 and 17:1 reduction ratios at temperature above 3500F. Extrusion equipment and accessory tooling is discussed. Fine grained, low interstitial ingots were obtainable by blending, isostatic pressing to 1 to 2.5-in.-diam. rods, hydrogen sintering, mechanically joining and single arc-melting with dc straight polarity at a melt rate of less than 2 lb/min with magnetic stirring coil reversal. (Author)

AD-266 715 Div. 17
(TIPTM/TCG) OTS price $1.75

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF PARTIALLY VOLATILE BRAZING FILLER ALLOYS FOR HIGH-TEMPERATURE APPLICATION AND RESISTANCE TO OXIDATION.
Rept. for 15 Mar 60-14 Mar 61 on Metallic Materials,
by Nikolajs Bredzs, John F. Rudy, and Harry Schwartzbart. June 61, 53p. incl. illus. table.
(Contract AF 33(616)6882, Proj. 7351)
(WADD TR 59-404, pt. 2) Unclassified report

DESCRIPTORS: (*Brazing, *Silver solders, Stainless steel, Mechanical properties, Shear stresses, Resistance to Oxidation, Test methods.) (*Soldering alloys, Nickel alloys, Indium alloys, Chromium alloys, Silicon alloys, Germanium alloys.) (Materials, Metals, Melting, High temperature research.)

The mechanical properties and the resistance to oxidation were determined for 304 stainless steel joints brazed with 61% Ni-39% In, 65% Ni-17% Cr-9% In-9% Si, 33% Ni-33% Cr-17% In-17% Ge, and 35% Ni-24% Cr-26% In-15% Ge filler alloys. The special technique developed for brazing these joints involved: (1) a method of preparation of the alloy so that a homogeneous and desired composition was available to fill the joint capillary, and (2) a method of volatilizing the melting point depressant which avoided the difficulty of boiling, while still obtaining sufficient volatilization to provide the required higher remelt temperature and good high-temperature properties. The highest shear strength was exhibited by the 65% Ni-17% Cr-9% Si alloy. The oxidation resistance of all joints was excellent. Joints brazed with the 61% Ni-39% In alloy showed considerable signs of oxidation after exposure to the open air for 500 hr at 1600 F. (Author)

AD-266 727 Div. 17, 14
(TIPTM/TCG) OTS price $.50

Clemson Agricultural Coll., S. C.
ORDERING IN OXIDE SOLID SOLUTIONS.
Rept. for May 60-Apr 61, on Research on Interface Phenomena,
by H. H. Wilson. June 61, 6p. incl. table, 13 refs.
(Contract AF 33(616)6870, Proj. 7022)
(ASD TR 61-92) Unclassified report

DESCRIPTORS: (*Solids, Solutions, Mixtures of *Magnesium compounds and Manganese compounds or Iron compounds or Cobalt compounds or Nickel compounds, Oxides in Controlled atmospheres, Sintering, Heat treatment, Preparation.) (*Crystal structure, Lattices, X-ray diffraction analysis.) Thermal diffusion.

A study was made of solid solutions formed from mixtures of MgO and ether with oxides of Mn, Fe, Co, or Ni to determine if, by suitable heat treatment, ordering could be induced in certain selected compositions. Heat treatment consisted of firing the prepared solid solutions in suitable atmospheres at 200-degree intervals from 200 C to 1200 C. The specimens were held at each temperature for 100 hr and analyzed by x-ray diffraction to detect superlattice formation. No superlattices were found. It is possible that the lack of ordering might be due to either insufficient time at the proper temperature or to the maximum temperature being too low to allow the required diffusion. Extended times, higher temperatures, and mechanical stress to enhance diffusion will be investigated. (Author)

AD-266 824 Div. 17
(TIPTM/TCG) OTS price $19.75

Lockheed Aircraft Corp., Sunnyvale, Calif.
MECHANICAL, OXIDATION, AND THERMAL PROPERTY DATA FOR SEVEN REFRACTORY METALS AND THEIR ALLOYS.
Final rept.,
by T. E. Tietz and J. W. Wilson. 15 Sep 61, 290p. incl. illus. tables, 148 refs.
(Contract NOa(s) 60-6119-c)
Unclassified report

DESCRIPTORS: (*Refractory materials, *Metals, *Alloys, Mechanical properties, Oxidation, Temperature, *Bibliography.) (Niobium, Niobium alloys, Chromium, Chromium alloys, Molybdenum, Molybdenum alloys, Rhenium, Rhenium alloys, Tantalum, Tantalum alloys, Vanadium, Vanadium alloys, Tungsten, Tungsten alloys.) (Transition temperature, Plasticity, Crystallization, Elasticity, Tensile properties, Creep, Stresses, Rupture, Microstructure, Hardness, Fatigue (Mechanics), Oxidation inhibitors, Thermal conductivity, Thermal expansion.) (High temperature research, Specifications, Chemical analysis.)

This report is a supplementary compilation on the mechanical properties and oxidation resistance of the refractory metals Cr, Co, Mo, Re, Ta, W, V, and their alloys. Tensile, creep, transition temperature, oxidation, thermal conductivity, and thermal expansion data are listed for these metals and their alloys. Recrystallization, stress rupture, strain rate and aging, grain growth and size, ductile-brittle behavior, and interstitial impurities data are also given.

AD-266 849 Div. 17
(TIPTM/TCG) OTS price $1.00

Watervliet Arsenal, N. Y.
ELEVATED TEMPERATURE FATIGUE PROPERTIES OF TWO LOW ALLOY STEELS,
by C. A. Penrose. May 61, 32p. incl. illus. tables (Technical rept. no. WVT RR 6104 R)
(DA Proj. no. 50101 031)
Unclassified report

DESCRIPTORS: (*Ordnance steel, *Steel, Alloys, Heat treatment, *Fatigue (Mechanics), Tests, Tensile properties, Stresses, Transition temperature, Measurement, Lattices, X-ray diffraction analysis, Impact shock.) High-temperature research.

Two low alloy steels, heat treated to yield strengths approximating 175,000 and 150,000 psi, were fatigue tested under rotating beam conditions at temperatures of 70, 400, 600, 800 and 1000 F. The fatigue data is related to the tensile properties at various test temperatures. Temper embrittlement, occurring during the course of fatigue testing and its effect on the fatigue properties, is also demonstrated. For the steels investigated, the elevated temperature tensile properties appear to be good predictors of elevated temperature fatigue behavior. However, the occurrence of a subcritical temperature phenomenon to which the specific steel is susceptible (such as temper embrittlement) will affect the fatigue behavior and destroy its fatigue-tensile relationship. (Author)

AD-266 872 Div. 17
(TIPTM/TCG) OTS price $1.10

Case Inst. of Tech., Cleveland, Ohio.
RESEARCH ON INTERSTITIAL ALLOYING ELEMENTS IN THE MECHANICAL BEHAVIOR OF METALS.
Quarterly rept. no. 10, 16 July-16 Oct 61,
by H. Cook, J. Destrez and others. Nov 61, 2p.
(Contract AF 33(616)6419)
Unclassified report

DESCRIPTORS: (*Hydrogen embrittlement, *Steel, *Nickel alloys, Mechanical properties, Failure

(Mechanics), Deformation, Plasticity, Controlled atmospheres, Resistance, Measurement.) (Brittle materials, Metals, Alloys, Tensile properties, Stresses, Aging.)

Hydrogenerated K-monel showed nonuniform distribution of H to a depth of 0.005 in. The embrittlement of the charged alloys decreased as the strain rate increased above 1 in./min. At 19,000 in./min, the ductility returned to that of the uncharged material; ductility recovery occurred at strain rates below 1 in./min. Placing a drop of H20 at the tip of the crack of 4340 sheet specimens (notched and precracked) greatly decreased the failure time. Failure tests conducted in controlled atmospheres, dry air, and Ar produced inconclusive results. Resistance measurements showed that the failure took place by discontinuous crack propagation. Interstitial induced delayed brittle-failure tests have indicated full recovery from strain-age embrittlement.

AD-266 876 Div. 17, 26
(TIPTM/TCG) OTS price $5.60

Ladish Co., Cudahy, Wis.
BERYLLIUM FORGING PROGRAM.
Interim technical engineering rept. 1 Apr-30 Sep 61,
by A. F. Hayes and J. A. Yoblin. Nov 61, 46p. incl. illus. tables.
(Contract AF 33(600)36795, Proj. 7-647)
(ASD TR 7-647, Vol. 6) Unclassified report

DESCRIPTORS: (*Beryllium, Forging, Manufacturing methods, Deformation, Tensile properties, Test methods, Heat treatment, Plasticity, Dies, Design.) (Aircraft, Materials.)

Unclad Be was forged successfully in closed dies on an experimental production basis using expendable die components of hot carbon steel which reduce tensile stresses while deforming plastically. Reproducibility was achieved through development of tooling and forging sequences applicable to the specific shapes required. The final forging configuration for 2 parts was produced repetitively while production runs of the initial, extrusion forging operation were also completed for 2 other parts. Preliminary tryouts are being conducted on the 2 remaining parts which have thin wall configurations. A successful method for ring rolling Be was not developed although results were sufficiently encouraging to warrant further investigation. A heat treatment investigation on separate heats of Be indicated that, within the limits of the treatments and the specific forgings investigated, a temperature of 1525 F for 16 hr followed by air cooling, imparts the most desirable combination of properties. (Author)

AD-266 883 Div. 17, 26
(TIPTM/TCG) OTS price $1.60

McDonnell Aircraft Corp., St. Louis, Mo.
MOLYBDENUM STRUCTURAL COMPONENT PROGRAM.
Progress rept. 1 July-1 Nov 61.
1 Nov 61, 17p. incl. illus. table.
(Contract NOw 61-0653-t)
Unclassified report

DESCRIPTORS: (*Molybdenum alloys, Titanium alloys, Zirconium alloys, Sheets, Processing, Machining, Manufacturing methods, Surface properties, Metallurgical analysis, Riveted joints.) (Metal coatings, Silicon coatings, Chromium compounds, Aluminum coatings, Molybdenum, Niobium.) (Structures, Tensile properties, Mechanical properties.) Marine rudders, Design, Metal joints, High temperature research.

Preliminary test and work requests were prepared for evaluating the Mo-0.5% Ti and TZM (Mo-0.5% Ti-0.10% Zr) alloy sheet. Studies were initiated for the design of a full scale rudder to be built from one or a combination of these two Mo alloys. Data are presented on tests to evaluate the feasibility of dimpling TZM, preliminary tests indicated that the dimpling of Mo sheet appears feasible using conventional ram coin dimpling equipment. Some evaluation was made on the compatibility of Nb- coated parts in contact with Mo- coated panels. Test results indicated that Co fittings could be nested between Mo structures without experiencing adverse affects. (Author)

AD-266 887 Div. 17
(TIPTM/TCG) OTS price $11.00

Pennsylvania State U., University Park.
EFFECTS OF TRIAXIAL STRESSES ON MECHANICAL PROPERTIES OF METALS UNDER HIGH PRESSURE.
Final rept.
by L. W. Hu, E. E. Headington, and others.
Sep 61, 150p. incl. illus. tables, 48 refs.
(Contract AF 49(638)676)
(AFOSR-1716) Unclassified report

DESCRIPTORS: (*Metals, Alloys, *Aluminum alloys, Spheres, Effectiveness of *Stresses, Hydrostatic pressure on Fatigue (Mechanics), Plasticity, Deformation, Tensile properties, Mechanical properties, Test methods, Mathematical analysis, *High pressure research.)

Contents:
An investigation of the influence of the hydrostatic pressure on the fatigue life of an aluminum alloy 7075-T6, by L. W. Hu, R. H. Hoffman, and J. Schreiber.
Effect of tensile plastic deformation on three dimensional yield surface, by L. W. Hu, H. E. Shull, and K. D. Pae.
Plastic stress-strain relations and hydrostatic stress, by L. W. Hu.
The inclusion of hydrostatic stress component in yield condition and application, by L. W. Hu, and K. D. Pae.
Stress distribution in a compound cylinder subjects to tension, by L. W. Hy, and E. E. Headington.
A note on the plastic stress-strain relations in tension of 2017-T4 aluminum alloy under hydrostatic pressure, by L. W. Hu, and H. E. Shull.

AD-266 896 Div. 17, 27, 12
(TIPTM/GEC) OTS price $3.60

Mellon Inst. Of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS; ARTIFICIAL ENVIRONMENT.
Quarterly scientific rept. no. 14, 1 Aug-31 Oct 61,
by C. J. Owen and W. D. Ruble. 31 Oct 61, 33p. incl. tables.
(Contract DA 36-034-ORD-3277)
Unclassified report

DESCRIPTORS: (*Corrosion research, Materials for *Rocket cases, Guided missiles, Sheets, Alloys, Steel, Stainless steel, Titanium

alloys, Cobalt alloys.) Tests, Test methods, Corrosion, Corrosive liquids, Stresses, Heat treatment, Mechanical properties, Physical properties.

Stress corrosion testing of high strength steels and alloys (missile case materials) was continued. The samples tested were: D6Ac, 300M, Vascojet 1000, AM 355, PH 15-7 Mo, B120VCA, 4137 Co, Rocoloy 270, and Ardeform 301. The results of treating PH 15-7 Mo, Vascojet 1000, and D6Ac are presented. No corrosion failures of these samples were recorded. Data on the exposure of specimens to marine, semi-industrial, and industrial environments are reported. For 4137 Co tempered at 75% maximum yield strength provided immunity from stress corrosion up to the yield point. The cumulative results for AM 355, PH 15-7Mo, B120VCA, 4137 Co, and Ardeform 301 are included.

AD-266 963 Div. 17
(TIPTM/GEC) OTS price $1.50

Battelle Memorial Inst., Columbus, Ohio.
STATISTICAL EVALUATION OF RENE 41 TENSILE PROPERTIES.
Rept. on Development of Property Design Criteria for Metals,
by Donald P. Moon, Glenn H. Beatty, and Ronald J. Favor. Sep 61, 44p. incl. illus. tables.
(Contract AF 33(616)6410, Proj. 1(8-7381))
(ASD TR 61-516) Unclassified report

DESCRIPTORS: (*Heat resistant alloys, Refractory materials, Sheets, Quality control, Statistical analysis, *Nickel alloys, Chromium alloys, Cobalt alloys, Molybdenum alloys, Titanium alloys, Aluminum alloys.) (Tests, Test methods, Tensile properties, Heat treatment.)

Routine quality-control acceptance-test results for Rene 41 sheet were evaluated statistically to show the relative variance in properties that may be attributable to producer, sheet thickness, heat, sheet, and specimen; the variance among individual specimens within a sheet often exceeds that attributable to all other factors combined. The distribution of properties revealed that, for the data examined, the assumption of normality is not valid for design purposes. This is particularly true at the low-strength end of the distribution, where the frequency of values is higher than for the normal distribution. Since this is the portion of the distribution from which design values are usually selected, a note of caution is given the designer. The results are based on Rene 41 sheet of a specified thickness range (0.013 to 0.071 in.) and heat treatment (solution heat treated at 1975 and aged at 1400 F for 16 hr). The observations do not apply to Rene 41 in other forms, sizes, or heat treatments, or to other materials. (Author)

AD-266 964 Div. 17, 26
(TIPTM/EJH) OTS price $9.60

Metals Research Lab., Mass. Inst. of Tech., Cambridge.
ACTIVATED SINTERING OF PRESSED TUNGSTEN POWDERS AND PLASMA JET SPRAYED TUNGSTEN DEPOSITS.
Final rept. 1 Oct 60-31 Aug 61,
by J. H. Brophy, H. W. Hayden, and others.
25 Sep 61, 106p. incl. illus. tables, 25 refs.
(Contract NOw 61-0326-d)
Unclassified report

DESCRIPTORS: (*Tungsten, Powder metals, Metal coatings, Flame spraying, Electric arcs, Plasma jets, Deposits, *Sintering, Reaction kinetics, Catalysts, Nickel catalysts, Nickel, Zinc.) (*Flame spraying, Controlled atmospheres, Gases, Nitrogen, Hydrogen.) (Powder metals, Powder alloys, Tungsten alloys, Nickel alloys, Physical properties, Porosity, Density, Control, Microstructure, Mechanical properties.) (Tungsten compounds, Oxides, Nickel compounds, Nitrates, Reduction, Hydrogen.)

The strength and structure of plasma arc sprayed W deposits were examined for air and protective atmosphere chamber spraying. As deposited density was varied from 50 to 90%. The application of Ni to activate densification of W deposits by subsequent heat treatments was studied. A mechanism for this process was established by analyzing the kinetics of densification of W powder in the presence of Ni and other activating elements. (Author)

AD-266 977 Div. 17
(TIPTM/BRW) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
EVALUATION OF THE DUCTILITY RATIO OF AGE HARDENED ALL BETA TITANIUM ALLOY Ti-13V-11Cr-3Al,
by Ralph Papirno and George Gerard. Oct 61, 23p. illus. (Technical rept. no. SM 61-17)
(Contract NOa(s) 59-6257-c)
Unclassified report

DESCRIPTORS: (*Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Sheets, Tensile properties, Hardening, Aging.) (Stresses, Elasticity, Tests, Test methods, Photoelastic materials.) (Structures, Design.) Mechanical properties.

A rational measure of ductility called the ductility ratio was developed for application in the design of tensile structures which contain stress concentrations and are fabricated of limited ductility materials. The ductility ratio was obtained from a series of strength tests of notched tensile specimens with increasing values of concentration factor. To demonstrate how this measure of ductility could be applied in the design of structures, the ductility ratio of age hardened Ti-alloy Ti-13V-11Cr-3Al was evaluated and a design chart based upon the test data was constructed. An analytical method for determining the elastic concentration factor, which serves as a reference value in the computation of the ductility ratio, was substantiated by a series of tests on photoelastic notched tension specimen models. (Author)

AD-266 990 Div. 17, 25
(TIPTM/GEC) OTS price $6.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF NIOBIUM AGAINST OXIDATION AT ELEVATED TEMPERATURES.
Final rept.,
by G. M. Gordon and Rudolf Speiser. 14 Oct 60, 60p. incl. illus. tables, 13 refs. (Rept. no. 467)
(Contract N6onr-22528, Proj. NR 039-005)
Unclassified report

DESCRIPTORS: (Oxidation, *Corrosion inhibition, *Heat resistant alloys, Corrosion resistant alloys, *Niobium alloys, Zirconium alloys, Titanium alloys, Design, Manufacturing methods, Processing.) (Temperature, Phase studies, Reaction kinetics, X-ray diffraction analysis.) Refractory materials.

A mechanism is proposed for the oxidation of a series of Nb-Zr and Nb-Zr-Ti alloys in air at temperatures above 700 C. It is based on the mode of nucleation of alpha Zr from oxygen-saturated beta solid solution. Metallographic and x-ray diffractometric techniques were used in the formulation of the proposed mechanism. (Author)

AD-266 992 Div. 17, 25, 4
(TIPTM/EJH) OTS price $1.60

Watertown Arsenal Labs., Mass.
THE ROLE OF DILUTE BINARY TRANSITION ELEMENTS ON THE RECRYSTALLIZATION OF TITANIUM,
by Ernest P. Abrahamson, II. Nov 61, 11p. incl. illus. (Technical rept. no. WAL-TR-830.3/6)
(DA Proj. 5B93-32-001)
Unclassified report

DESCRIPTORS: (*Titanium alloys, *Transition elements, *Crystallization, Temperature, Transition temperatures, Phase transitions, Quantum mechanics, Atomic structure.) Titanium, Solids, Solutions.

The effect of transition element binary solid solution additions upon the recrystallization temperature of Ti was investigated. All additions, except Nb and W, raised the recrystallization temperature. A correlation is obtained between the logarithm of the absolute rate of change of recrystallization temperature with atomic percent solute and the number of outer d shell electrons attributed to the free atom of the solute element in its ground state. (Author)

AD-267 030 Div. 17
(TIPTP/MFA) OTS price $1.10

Rensselaer Polytechnic Inst., Troy, N. Y.
THEORETICAL STUDY OF LUBRICATION AND FRICTION.
Final rept. 27 May 60-26 May 61,
by Edward Saibel. 26 May 61, 2p.
(Contract DA 30-115-ORD-901)
(AROD rept. no. 1944:11)
Unclassified report

DESCRIPTORS: *Research program administration, Theses.

AD-267 077 Div. 17, 26
(TIPTM/EJH) OTS price $1.00

Defense Metals Information Center, Columbus, Ohio.
DEPARTMENT OF DEFENSE REFRACTORY METALS SHEET-ROLLING PROGRAM.
Status rept. no. 1,
by H. R. Ogden. 2 Nov 61, 32p. incl. illus. tables (DMIC Rept. no. 161)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: (Metals, Alloys, *Heat resistant alloys, *Refractory materials, *Niobium alloys, *Molybdenum alloys, *Tantalum alloys, *Tungsten alloys, *Sheets, Production.) (Processing, Powder metallurgy, Melting, Heat treatment, Extrusion, Manufacturing methods, Rolling mills.)

A summary is presented of the status of the Department of Defense Refractory Metals Sheet-Rolling Program to accelerate the development of production techniques for high-quality, consistent sheet products from the refractory metals (Nb, Mo, Ta, and W) and their alloys. The program includes: (1) development of sheet production techniques, (2) establishment of minimum data required to evaluate mill production, (3) evaluation of fabrication characteristics of the sheet produced, and (4) establishment of design data. Contracts were awarded for the development of sheet production techniques for all four refractory metals. One contract was awarded for the evaluation of Mo alloy sheet fabrication characteristics. (Author)

AD-267 079 Div. 17
(TIPTM/REB) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF BERYLLIUM.
by Webster Hodge. 16 Nov 61, 4p. incl. table.
(DMIC Memo. no. 138)
Unclassified report

DESCRIPTORS: *Beryllium, Processing, Production, Purification, Welding, Corrosion, Radiation effects, Metals.

A review was made of recent literature dealing with Be technology. Eight publications are cited which are concerned with commercial production, purification by distillation, welding, corrosion, and radiation effects.

AD-267 099 Div. 17
(TIPTM/REB) OTS price $9.60

Thompson Ramo Wooldridge, Inc., Cleveland, Ohio.
DEVELOPMENT AND EVALUATION OF HIGH TEMPERATURE PROTECTIVE COATINGS FOR COLUMBIUM ALLOYS. PART I. COATING DEVELOPMENT.
Rept. for Apr 60-Apr 61 on Metallic Materials,
by R. A. Jefferys and J. D. Gadd. May 61,
103p. incl. illus. tables.
(Contract AF 33(616)7215, Proj. 7351)
(ASD TR 61-66) Unclassified report

DESCRIPTORS: (*Refractory coatings, *Niobium alloys, Chromium alloys, Titanium alloys, Silicon alloys, Oxidation, Erosion, *Heat resistant alloys.)

A detailed study was made of the formation and protective nature of surface alloy diffusion coatings for columbium. Vacuum vapor deposited, diffusion alloy coatings combining chromium, titanium and silicon were found to protect D-31 alloy, F-48 alloy and unalloyed columbium from surface oxidation or internal contamination for considerable lengths of time in air in the range of 2000 to 2600 F and for shorter periods up to 2800 F. Tests on the coating-base metal systems included cyclic oxidation, thermal shock and high velocity-hot gas erosion in a plasma flame. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-266 189 Div. 18
(TIPTW/RD) OTS price $10.10

Teleregister Corp., Stamford, Conn.
INTEGRATED ON-LINE SYSTEMS APPROACH TO NAVY SUPPLY OPERATIONS. VOLUME II.
Final rept.
14 July 61, 1v. incl. illus. tables (Rept. no. ER-105, Vol. 2)
(Contract Nonr-340800)
Unclassified report

DESCRIPTORS: (*Naval supplies, *Naval logistics, *Naval procurement, Scheduling, Automation, Costs.) (Statistical data, Data processing systems, Data storage systems, Effectiveness.) (Data transmission systems, Digital systems, Communication systems, Effectiveness.)

Possible solutions are outlined to the integrated on-line system requirements as specified in AD-266 190. The purpose of the solutions is to determine the practicality and cost of providing integrated on-line data processing for the navy supply system, using presently available data processing hardware and techniques. The investigation is not intended to provide solutions for actual implementation. Rather, the object is to provide rough estimates of sufficient accuracy for evaluation of the desirability for further action. Another object is to indicate the significant areas affecting cost and application so that these areas may be concentrated on in further analysis and in gathering statistical data. The solutions are formulated to the extent possible in terms of generalized units of hardware rather than specific manufacturer's products. The major components of an integrated on-line system and their inter-relationships are illustrated. (Author)

AD-266 190 Div. 18
(TIPTW/RD) OTS price $10.10

Teleregister Corp., Stamford, Conn.
INTEGRATED ON-LINE SYSTEMS APPROACH TO NAVY SUPPLY OPERATION. VOLUME I.
Final rept.
14 July 61, 1v. incl. illus. tables (Rept. no. ER-105, Vol. 1)
(Contract Nonr-340800)
Unclassified report

DESCRIPTORS: (*Naval supplies, *Naval logistics, *Naval procurement, Scheduling, Costs, Automation.) (Statistical data, Data processing systems, Data storage systems, Effectiveness.) (Data transmission systems, Digital systems, Communication systems, Effectiveness.)

A study is presented of the application of integrated on-line processing to the total Naval supply system. It includes the derivation of functional, data transmission, and data storage requirements and outlines salient features of on-line Naval supply system. Various systems and hardware configurations are discussed. Estimates of systems costs are developed and conclusions are drawn on practicality of on-line approach. (Author)

AD-266 524 Div. 18
(TIPTW/RD) OTS price $9.60

Air Force Inst. of Tech. School of Logistics, Wright-Patterson Air Force Base, Ohio.
AN EVALUATION OF HOW THE AIR FORCE CAN TAILOR ITS PROCUREMENT PRACTICES TO BEST SATISFY THE CONGRESSIONAL DESIRE FOR OPTIMUM COMPETITION,
by Arthur W. Rochlin, Charles J. Cesky and others. 1 June 61, 109p. incl. tables.
(In cooperation with Ohio State U.)
Unclassified report

DESCRIPTORS: (*Air force procurements of Air force supplies, Control by Congress.)

In the formulation of the law which provides for Department of Defense procurement, legislators had as their keystone consideration the concept of competition achieved principally through advertising. The contractual methodology employed has become more sophisticated; forces and influences surrounding the procurement function have become numerous and more difficult to satisfy for social, economic and technical reasons. The transition and dichotomy of Congressional reaction to these forces and influences are considered. The report summarizes pertinent statements of prominent legislators who survey this area in the light of today's environment. Since it is impossible for the writers of the law to extend themselves into the role of its execution, that responsibility is transmitted. As with any transmission of concepts there are losses between the sender and the receiver. The extent of these losses is evaluated. The history and success of the Small Business Program is reviewed with the objective of reaching an evaluation of its principal elements. The report also covers the role of Headquarters AFLC as the command organization responsible for the extension of the use of advertising in the area of replenishment spare parts and maintenance services. (Author)

AD-266 525 Div. 18, 26
(TIPTW/RD) OTS price $9.10

Air Force Inst. of Tech. School of Logistics, Wright-Patterson Air Force Base, Ohio.
LOGISTICS PLANNING.
Research rept.,
by Carl E. Trimble, Fred H. Jones, and William R. Bigler. 1 June 61, 99p.
(In cooperation with Ohio State U.)
Unclassified report

DESCRIPTORS: (*Air force logistics, *Scheduling.) (Management engineering, Research program administration.) Air force operations.

The following conclusions were among those drawn regarding logistics planning. (a) There are wide differences of opinion among Air Force logistics planners as to what planning is, (b) More time and attention should be devoted to evaluation of the planning process and to the testing of plans before full acceptance and implementation, (c) Concurrency of planning at different levels generally results in better plans and greater confidence in their successful execution, (d) A better planning product will result from a more careful selection of planners, integration of logistics and operations planning groups, and the location of all planners working on the same problem in the same or adjacent offices, (e) The concept of a ''Master Plan of Logistics'' (included) offers a means for accomplishing improved

logistics planning in the USAF, and (f) The USAF should develop a concept of logistics planning that would provide top management a ''blueprint'' of activity for long range uses. Such a concept is in consonance with a philosophy of planning being circulated in many areas of the government by the present administration. (Author)

AD-266 526 Div. 18, 26
(TIPTE/RD) OTS price $9.60

Air Force Inst. of Tech. School of Logistics, Wright-Patterson Air Force Base, Ohio.
SELECTIVE SYSTEMS MANAGEMENT,
by Johnson R. Saunders, Richard Tingey, and Arthur C. Pfister. 1 June 61, 103p. incl. illus. tables.
(In cooperation with Ohio State U.)
Unclassified report

DESCRIPTORS: (Logistics, *Air force logistics, Air force supplies, Air force procurement, *Management engineering, Research program administration.) (Air force supplies, Control, Maintenance, Quality control.) (Naval logistics, Naval supplies, Naval procurement, Management engineering.) Military procurement.

The following conclusions were drawn regarding logistics selective systems management: (1) The Air Force needs a formal program to select systems which merit systems management; (2) The Air Force needs a procedure for periodically evaluating each systems' requirement for preferred management and for phasing-out those systems from the systems management concept where the requirement no longer exists; (3) Officially, criteria do not exist for the phase-out of systems from the systems management concept and such guidance should be established; (4) Until cost and management evaluation reports provide proper data (such as accurate AOCP reports, complete costing informats), judgment decisions must be used in the selective management processes; (5) An extended area of common interest between the Air Force Systems Command (AFSC) and Air Force logistics command (AFLC) has been created by the organization of these two commands; and (6) The automatic re-supply logistic system is not being given fair consideration. (Author)

AD-266 531 Div. 18
(TIPTE/NTM) OTS price $1.10

Hughes Aircraft Co., Culver City, Calif.
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM.
Monthly progress rept. 1 Oct-1 Nov 61,
by K. M. Spradlin. 9 Nov 61, 5p. incl. illus.
(GSG rept. no. 1610.30/163; SD 61-186)
(Contract DA 18-108-cml-6618)
Unclassified report

DESCRIPTORS: (*Antiaircraft defense systems, *Shelters, *Portable shelters, *Air conditioning equipment, *Particulate filters, Safety devices, Pneumatic devices, *Radar trailers, Trailers, Vehicles, Installation, Design.) (Biological warfare, Chemical warfare, Radiological warfare, Aerosols.)

The filter assembly design has progressed to the point that it appears possible one filter assembly configuration can be made to serve all AN/MSG-4 System vehicles and shelters, except the AN/MPS-23 antenna trailer. New design requirements for the antenna trailer filter were established. Protective entrance design was concentrated on the entrance for the AN/TSQ-38 Helihut. That design was revised to provide 2 entrance compartments in series. The entrance for other vehicles remains a single compartment entrance. (Author)

AD-266 794 Div. 18, 26
(TIPTW/RD) OTS price $2.60

Air Force Inst. of Tech. School of Logistics, Wright-Patterson Air Force Base, Ohio.
REALISTIC PRICING OF NEGOTIATED FIRM FIXED PRICE CONTRACTS BY ANALYSIS OF COST DATA, COMPETITION, OR OTHER ANALYSIS TECHNIQUES.
An Advanced Logistics rept.,
by Thomas J. Pawlowski, Jr., William R. Lanum, and Leonard S. Stone. 1 June 61, 117p. incl. illus.
(In cooperation with Ohio State U. Research Foundation)
Unclassified report

DESCRIPTORS: (*Air force procurement, Government procurement, Air force logistics, Costs.) (*Costs, Data, Analysis.)

The following conclusions were drawn regarding contract negotiations: (1) The existence of effective competition is the deciding factor as to whether or not cost data are required. However - there are wide variations of opinion in both government and industry as to what criteria constitutes effective competition; (2) Similarly, there are wide variations of opinion in government and industry as to what criteria determines whether an item is proprietary, commercial or catalogue; (3) There has been a definite trend by industry to categorize an increasing number of products as catalogue items for the sole purpose of evading submission of cost data under the pretext that a catalogued item is competitive; and (4) Currently, the technique most commonly used by Air Force Procurement personnel for establishing realistic prices is analysis of detailed supporting cost data. (Author)

AD-266 961 Div. 18, 6
(TIPTP/MFA) OTS price $3.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN APPROACH TO LINE-OF-SIGHT PROBLEMS IN SURVEILLANCE-EQUIPMENT SPECIFICATION AND EVALUATION,
by James M. Wolf. Nov 61, 29p. incl. illus. table (Rept. no. 2900-254-T)
(Contract DA 36-039-sc-78801, Proj. Michigan)
Unclassified report

DESCRIPTORS: (*Military intelligence, Terrain, Analysis.) (Stereoscopic map-plotters, *Aerial reconnaissance, Geometry, Optical equipment, Mapping, Theodolites.) (Experimental data, Tables, Photographic analysis.)

A generalization is developed that is useful in evaluating the effect of elevating a sensory device to improve the line-of-sight coverage. In a terrain having valleys of varying depth and hilltops all the same height, the fraction of a valley that is not in defilade tends to be proportional to the height of the vantage point and to the width of the valley. It is inversely proportional to the range of the valley and to the depth of the valley. If the height times the

width, divided by the range and the depth gives a number equal to or greater than four, substantially the whole of the valley can be seen. For terrains of this class characterized by random variations in the width-to-depth ratio, a simple dependence on this same number results, if the average width-to-depth ratio is used. There is also dependence on a second number which represents how consistent the roughness of the terrain is. The development was extended to determine the area visible to airborne side-looking and to all-around-looking surveillance devices as a function of their heights. (Author)

19. NAVIGATION

AD-266 273 Div. 19, 6
(TIPTW/DLW) OTS price $4.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
A STUDY OF THE REQUIREMENTS FOR ARRIVAL RADAR HANDOFFS AND CONTINUOUS FLIGHT FOLLOWING OF AIRCRAFT,
Final rept.,
by N. A. Houska. May 61, 47p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (*Air traffic control systems, Ground controlled approach radar, Radar tracking, *Air traffic controllers, *Airport radar systems, Effectiveness, Tests, Simulation, Feasibility studies.) (Air traffic, Flight paths, Handling, Display systems, Safety.)

Investigations were made to determine if additional facility staffing is required for radar handoff of arrival aircraft, and to determine the feasibility of continuous radar flight following of aircraft, particularly in holding patterns. For comparison with subsequent phases, a high-density terminal area was simulated, using present facility staffing to perform the handoff functions. Various modifications, utilizing additional personnel for the radar handoff function, were subsequently simulated. Simulation tests indicated that radar handoffs and continuous radar monitoring of holding aircraft cannot be accomplished with present facility staffing. However, with some minor modifications, present operational facilities could implement handoff positions in both the center and approach control. (Author)

AD-266 316 Div. 19, 8
(TIPTE/CRJ) OTS price $1.60

Ryan Aeronautical Co., San Diego, Calif.
ANTENNAS FOR NAVIGATION SET, RADAR AN/APN-130(V).
Final engineering rept.
May 61, 16p. incl. illus. tables (Rept. no. 10163-17)
(Contract NOw 60-0203)
Unclassified report

DESCRIPTORS: (*Helicopters, *Radar navigation, Doppler navigation, Doppler radar.) (*Radar antennas, Radar navigation, Airborne, Design, Installation, Tests.) Antennas.

The AN/APN-130(V) antennas for both types of helicopters, HSS-2 and HU2K-1, are functionally alike. However, installation work for each type of aircraft calls for slightly different installation techniques. The antenna waveguide assembled parts are rigidly potted inside the antennas. The antennas are hermetically sealed and require no routine maintenance. Improvements made on the antennas as a result of the preproduction tests will assure reliable performance. The antenna beam geometry, RF leakage, crystal mixer excitation, and antenna gain tests indicate that the antennas are capable of satisfactorily performing the navigation function for which they were designed. The AN/APN-130(V) will provide helicopters with essential doppler actuated ground movement indications for Anti-Submarine Warfare, vertical envelopment, search, rescue, and other special applications where precise navigation capabilities are required. (Author)

AD-266 578 Div. 19, 1
(TIPTA/LSK) OTS price $1.10

General Dynamics/Convair, San Diego, Calif.
PRE-CERTIFICATION FLIGHT TEST RESULTS FOR 880M AIRPLANE,
by D. W. Hunnicutt. 15 Aug 61, 3p. illus. tables (Rept. no. ZN-535)
Unclassified report

DESCRIPTORS: Commercial planes, Transport planes, *Jet planes, Flight testing, Automatic, Direction finding, *Radio navigation, Radio equipment, Range finding, Very high frequency.

The pre-certification flight test results are presented for the Automatic Direction Finder (ADF) abd VHF Omni-Range (VOR) Systems presently installed on the Convair 880M airplane. Both systems functioned properly. (Author)

AD-266 651 Div. 19, 26
(TIPTE/CDM) OTS price $1.60

A. C. Spark Plug Div., General Motors Corp., Milwaukee, Wis.
16 PIGA.
Monthly progress rept., 1-31 Mar 61.
Mar 61, 11p. incl. illus. tables.
(In cooperation with Instrumentation Lab., Mass. Inst. of Tech., Cambridge, Contract AF 04(647)303)
Unclassified report

DESCRIPTORS: (*Gyroscopes, Bearings, Reliability, Tests, Manufacturing methods, Production.)

AD-266 758 Div. 19, 2
(TIPTA/LSK) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AUTOMATIC CONTROL OF THE MOVEMENT OF A BODY IN INERTIAL SPACE,
by V. A. Bodner and V. P. Saleznev. 3 Nov 61, 21p. incl. illus. table (Trans. no. FTD-TT-61-155 of Izvestiya Akademii Nauk SSSR, Otedleniye Tekhnicheskikh Nauk, Energetika i Avtomatika 4:197-207, 1961)
Unclassified report

DESCRIPTORS: (Control systems, Inertial navigation, Space navigation, *Orbital flight paths, *Automatic navigators.) (Thrust, Drag, Gravity.) Celestial mechanics. (Technological intelligence, Translations, USSR.)

The work discusses a study of a system for the automatic control of the direction of a moving object, the required laws of control are established, the conditions of realizing program control are investigated, and the influence of random disturbances on the dynamics of control is shown. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-266 164 Div. 20, 16
(TIPTB/CDW) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
THE EFFECT OF GAMMA RADIATION ON VISCOSITY AND ENZYMATIC ACTIVITY OF UREASE SOLUTIONS,
by E. Anne Dickens and Bernard Shapiro. Sep 61, 6p. incl. illus. 16 refs. (Rept. no. 61-85)
Unclassified report

DESCRIPTORS: (*Gamma rays, *Radiation effects on *Urease, Solutions, Radioprotective drugs, Viscosity, Biochemistry, Biophysics, Radiochemistry.)

Solutions containing urease, urease and (GES)2 and urease-SEG in 0.047 M sodium phosphate buffer at pH 7.5 were irradiated with cobalt-60 gamma rays in doses up to 750,000 r. The specific viscosity of urease decreases initially and then levels off at about three-fourths the original value. Protection against these irradiation-produced viscosity changes occurs in urease solutions containing (GES)2 but not in solutions containing only urease-SEG. The enzymatic activity of urease solutions decreases as a result of gamma irradiation. Addition of (GES)2 inhibits the enzyme; however, in solutions containing only urease-SEG, the enzymatic activity is partially restored by gamma irradiation. The enzymatic activity of solutions of urease containing (GES)2 is almost completely destroyed by irradiation. The viscosity changes in irradiated urease solutions are interpreted as indicating intramolecular rearrangement. Two ways in which (GES)2 could prevent his rearrangement have been indicated. Reactivation of urease-SEG solutions by irradiation is also interpreted in terms of the proposed intramolecular rearrangement. (Author)

AD-266 557 Div. 20, 25, 14
(TIPTB/LH) OTS price $16.00

Lockheed Aircraft Corp., Sunnyvale, Calif.
EFFECTS OF NUCLEAR RADIATION ON THE OPTICAL, ELECTRICAL AND THERMOPHYSICAL PROPERTIES OF SOLIDS. AN ANNOTATED BIBLIOGRAPHY. Addendum to the Space Materials Handbook,
comp. by Robert C. Gex. Aug 61, 234p. (Rept. no. 3-34-61-8; Special bibliography no. SB-61-42)
(Contract AF 04(647)673)
Unclassified report

DESCRIPTORS: *Bibliography, Neutrons, *Radiation damage, *Radiation effects, Materials, Metals, Alloys, Ceramic materials, Plastics, Alkali metal compounds, Halides, Alpha particles, Deuteron bombardment, Electron bombardment, Gamma rays, Proton bombardment, Beta particles, X rays.

Annotated references (579) are presented on the effects of nuclear radiation on selected properties of a wide range of solid materials. The properties included are: optical absorptance, reflectance, transmittance and emittance; electrical resistivity and conductivity; refractive index; dielectric constant and strength; magnetic permeability; thermal conductivity; and heat capacity. The references are grouped into 6 broad subject categories - General and Surface Studies; Metals and Alloys; Ceramics; Plastics and Other Organic Materials; Alkali halides; and Azides. The references are arranged by property affected and type of radiation within each category. There is an index to specific materials, e.g., copper, polyethylene, etc. Some studies of x-rays are included. Several classes of solids are specifically excluded; silicon and germanium, compound semiconductors and some other intermetallic compounds. (Author)

AD-266 561 Div. 20, 25
(TIPTP/MFA) OTS price $1.60

Ecole Normale Superieure (France).
CORRECTION TO INTRINSIC MAGNETIC MOMENTS BY CENTRAL AND TENSOR FORCES,
by B. Bremond. June 61, 18p. incl. tables. (Technical note no. 26)
(Contract AF 61(052)173)
(AFOSR-1568) Unclassified report

DESCRIPTORS: (*Nuclear magnetic moments, Nuclear shell models, Nuclear forces, Superconductivity, *Nucleons, Nuclei, Protons, Neutrons, Particles, Energy, Configuration.) (Perturbation theory, *Tensor analysis, Integration.) (France, Translation.)

The magnetic moment correction by central and tensor interactions between a nucleon of specific momentum and spin and the Fermi sea are studied. The intrinsic magnetic moment operator is stated. The correction value is calculated by a second order perturbation method. The results are in qualitative agreement with the doubly-magic-plus-or-minus-one nuclei magnetic moments. (Author)

AD-266 589 Div. 20, 16
(TIPTB/CCH) OTS price $1.60

School of Aerospace Medicine, Brooks Air Force Base, Tex.
LATE TESTICULAR LESIONS IN IRRADIATED MONKEYS (MACACA MULATTA),
by James A. Pitcock. June 61, 13p. incl. illus. tables, 40 refs. (Rept. no. 61-72)
Unclassified report

DESCRIPTORS: (*Radiobiology, *Radiation injuries, *Testes of Laboratory animals by Gamma rays, Neutrons.) Tests, Dose rate, Tables.

Prepubertal Macaca mulatta monkeys were exposed to acute and fractionated doses of gamma or neutron radiation or to both. Testicular tissues were examined 3 to 8 years later for the presence and severity of permanent lesions. The Macaca mulatta monkey is more sensitive to the permanently damaging effects of ionizing radiation than are the common small laboratory animals and may be comparable to man. Lesions were demonstrated in animals exposed to as little as 154 rep of gamma radiation and a threshold of 57 rep was estimated. The relative biologic effectiveness for neutrons could not be determined, but it is probably less than 2. The degree of testicular damage is relatively independent of dose rate and fractionation but is dependent primarily on the cumulative dose administered. (Author)

AD-266 602 Div. 20, 25
(TIPTA/SEB) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
CONSISTENT P1 ANALYSIS OF AQUEOUS URANIUM-235 CRITICAL ASSEMBLIES,
by Daniel Fieno. Nov 61, 49p. incl. illus. tables, 20 refs. (NASA Technical note D-1102)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1102.

DESCRIPTORS: (*Uranium, Isotopes, Atoms, Neutrons, Fission neutrons, Delayed neutron fraction, Neutron lifetime, Neutron flux density, Buckling, Elastic scattering, Inelastic scattering, Critical assemblies, Quantum mechanics, Mathematical analysis, Mathematical computer data, Fourier analysis, Equations.) (Uranyl radicals, Fluorides in Water.)

The lethargy-dependent equations of the consistent P1 approximation to the Boltzmann transport equation for slowing down neutrons, as developed in this present study, was used as the basis of an IBM 704 computer program. This program was used to compute the age of fission neutrons in water as 26.5 sq. cm. as compared to a recent experimental value given as 27.86 sq. cm. The Fourier transform of the slowing-down kernel for water to indium resonance energy calculated here compares well with the Fourier transform of the kernel for water. This method of calculation has also been applied to UO2F2-H2O solution critical assemblies. Theoretical results established for both unreflected and fully reflected critical assemblies compare well with available experimental data. (Author)

AD-266 646 Div. 20
(TIPTP/MFA) OTS price $2.60

Nobel Inst. for Physics (Sweden).
EVIDENCES FOR OCTUPOLE AND QUADRUPOLE VIBRATIONAL STATES IN Pb-205,
by I. Bergstrom, E. C. O. Bonacalza, and P. Thieberger. 1 Sep 61, 23p. incl. illus. table (Technical note no. 7)
(Contract AF 61(052)118; In cooperation with Royal Institute of Technology, Stockholm, Sweden)
(AFOSR-1565) Unclassified report

DESCRIPTORS: (*Lead, *Isotopes, *Vibration, Quadrupole moments.) (Phenons, Inelastic scattering, Excitation, Nuclear fluorescent scattering, Resonance, Half-life, Measurement, Electron transitions.) (Experimental data, Tables.)

It is shown by internal conversion coefficient measurements that the 2610 and 2567 keV states in Pb-205 are 9/2 +. It is suggested that the upper state is mainly due to the coupling of the 3- octupole core vibrational state and the 5/2- neutron hole ground state. Angular correlation measurements were made between the E1 gamma rays going from the 2610 keV and 2567 keV states to the 703 keV state, and the 703 keV gamma ray deexciting this state. If the E1 transitions are both assumed to be pure, it follows that the 703 keV gamma ray is due to 98% E2 radiation and 2% M1 radiation. The strong E2 enhancement in the 703 keV ground state transition (7/2- yields 5/2-) suggests that the 703 keV state might be due to one phonon quadrupole core vibration coupled to the 5/2- ground state of the odd neutron. There are also some evidences for the 1615 keV state being originated by a similar coupling between the odd neutron ground state and two phonon quadrupole core vibration. (Author)

AD-266 647 Div. 20
(TIPTP/MFA) OTS price $2.60

Nobel Inst. for Physics (Sweden).
THE DECAY ENERGY OF Bi-205,
by E. C. O. Bonacalza, P. Thieberger, and I. Bergstrom. 25 Sep 61, 21p. illus. (Technical note no. 8)
(Contract AF 61(052)118; In cooperation with Royal Institute of Technology, Stockholm, Sweden)
(AFOSR-1566) Unclassified report

DESCRIPTORS: (*Beta decay, Radioactive decay, Energy of *Bismuth, *Isotopes.) (Gamma rays, X-rays, Electron capture, Nuclear reactions, Bremsstrahlung, Nuclear shell models, Atomic spectrum, Neutrinos, Positrons.) (Experimental data, Theory, Equations.)

The decay energy of Bi-205 was determined by measuring the K and L X-rays which follow electron capture and feed the 2567 keV and 2610 keV levels. In this way the K to L, K to total and L to total capture ratios were found. Comparing these values with theoretical predictions, a total decay energy of 2703 ± 6 keV was established. This corresponds to a neutrino energy of 46 keV for K-capture to the 2567 keV level. Since this value disagreed with the previously determined maximum positron energy feeding the 703 keV level, the positron spectrum was remeasured and a value of 976 ± 10 keV was found. This yields a total decay energy of 2701 ± 10 keV, in good agreement with the capture value. K and L X-rays feeding the 1766 keV level were measured as a check of the method since, for such a large spacing, the ratios are rather insensitive to energy variations. The log ft values for the E.C. decay to the 2567 keV and 2610 keV levels were calculated yielding values of 6.60 ± 0.05 and 6.34 ± 0.06 respectively. (Author)

AD-266 676 Div. 20, 2
(TIPTP/WH) OTS price $9.10

Laboratory of Climatology, C. W. Thornthwaite Associates, Centerton, N. J.
THE CLIMATIC AND HYDROLOGIC FACTORS AFFECTING

THE REDISTRIBUTION OF SR-90.
Final rept.,
by J. R. Mather, J. K. Nakamura and C. W. Thornthwaite. Sep 61, 110p. incl. illus. tables.
(Technical rept. no. 1)
(Contract AF 49(638)887, Proj. 9774)
(AFOSR-1623) Unclassified report

DESCRIPTORS: (Climatic factors, Hydrology, *Radioactive isotopes, Radioactive fall-out, *Strontium, *Soils, Surface properties.) (*Radioactive isotopes, Strontium, Absorption, Soils, Mathematical analysis.)

The study of the influence of climatic and hydrologic factors on the movement of strontium through the upper layers of the soil produced a number of results: strontium which fell from the atmosphere was found to move through the upper part of the soil profile at a rate determined by the volume of leaching solution present and the chemical and cation exchange properties of the soil solution; a mathematical model of movement was established; the volume of the leaching solution is the climatic water surplus or the excess precipitation when the water holding capacity of the soil is filled; a manual for using high speed computers to compute the factors of the daily water balance was prepared; the influence of the soil solution in determining the rate of movement of strontium can be expressed in terms of the factor, leaching efficiency; leaching efficiency varies geographically from high values in moist regions to low values in dry regions for soils of the same texture; leaching efficiency is related to the moisture index; and from the data on volume of the leaching solution and the leaching efficiency, it is possible to determine the rate of redistribution of strontium in the upper layers of the soil at a large number of stations and to plot the results on maps for analysis. (Author)

AD-266 682 Div. 20, 25
(TIPTP/WH) OTS price $1.60

Stanford U., Calif.
A PHENOMOLOGICAL APPROACH TO THE ELECTRODISINTEGRATION OF THE DEUTERON,
by B. Bosco. Sep 61, 11p. incl. illus. table.
(Technical note no. 388-50)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR-1579)
Unclassified report

DESCRIPTORS: (*Deuterons, *Electron bombardment, Electrons, Quantum mechanics, *Electron transitions.) Nuclear physics.

Using the analytic properties of the matrix elements established in a previous paper (Phys. Rev. 123:1072, 1961), a phenomenological analysis of the results of Kendall and co-workers on the disintegration of the deuteron by electron impact is carried out. It is shown that it is possible to approximate the unphysical cuts with constants and obtain very good agreement with the experiments. This fact will enable one to evaluate the rescattering corrections in the case of Hofstadter's experiments. (Author)

AD-266 683 Div. 20, 25
(TIPTP/WH) OTS price $2.60

Stanford U., Calif.
RADIATIVE CORRECTIONS TO ELECTRON-PROTON SCATTERING,
by Allan S. Krass. Oct 61, 23p. incl. illus.
(Technical note no. 388-51)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR-1684)
Unclassified report

DESCRIPTORS: (Electrons, *Proton scattering, Photons, *Recoil atoms.) Quantum mechanics.

The radiative corrections to electron-proton scattering are calculated for an experiment in which the recoil proton is detected instead of the scattered electron. The emission of very hard photons by the scattered electrons is taken into account in the phase space integration. This calculation is intended for high-energy experiments (up to 5 Bev) but is applicable whenever the momentum resolution of the spectrometer is small. Mesonic contributions to the two-photon exchange diagrams are neglected. (Author)

AD-266 693 Div. 20, 4
(TIPTM/TCG) OTS price $1.60

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
LONG RANGE NUCLEAR SPIN-SPIN COUPLING. ALLENIC AND POLYACETYLENIC SYSTEMS,
by Eugene I. Snyder and John D. Roberts.
Oct 61, 15p. illus. 33 refs. (Technical rept. no. 14; Contribution no. 2741)
(Contract Nonr-22026, Proj. NR 055-388)
Unclassified report

DESCRIPTORS: (*Nuclear spins, *Allenes, *Acetylenes, Polymers, Chlorides, *Butadienes, Nuclear magnetic resonance, Analysis, Theory, Chemical bonds.)

A study was made to determine the magnitude and sign of coupling constants in allenic derivatives and to investigate some saturated systems for which significant super long-range coupling constants might reasonably be expected. Spin-spin coupling between protons separated by 5 to 9 chemical bonds were observed in allenic and polyacetylenic systems. Analysis of the nuclear magnetic resonance spectrum of 1-chloro-1,2-butadiene permitted the assignment of a negative sign to J13 opposite to the positive signs of J12 and J14. The relation of these results to the theory of proton-proton spin-spin coupling is discussed.

AD-266 768 Div. 20, 25
(TIPTP/MFA) OTS price $8.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ATOMIC ENERGY (SELECTED ARTICLES).
Sep 61, 89p. incl. illus. tables (Trans. no. MCL-1208 of Atomnaya Energiya 10:pp. 343-346, 372-373, 377-392, 396, 403-404, 406-407, 412-415, 420-422, 1961)
Unclassified report

DESCRIPTORS: (*Atomic energy, Scientific reports.) (Translations, USSR.) (Fission, Nuclear energy to Electricity, Thermionic emission, Diodes, Cathodes, Plasma physics, *Research reactors.) (Isotopes, Uranium, Plutonium, *Alpha particles.) (*Statistical analysis, Distribution theory.) (*Monochromatic light, Measurement, Thermal radiation, *Neutron spectrum, Graphite moderated reactors.) (*Liquid metals, Heat transfer, Turbulent flow.) (*Shafts, Torque couplings, Power, Seals.) (*Gamma rays, Scattering, Aluminum.) *Radioactive isotopes, *Atomic energy engineering.

Division 20-NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Contents:
Thermionic energy converters; Ternary fission of U-233, U-235, Pu-239, and Pu-241 Nuclei; Measurement of the kinetic characteristics of a reactor by a statistical p-Method; Distribution of the number of counts recorded by a neutron detector located in a reactor; Use of a monochromator to measure the thermal-neutron spectra of a nuclear reactor; Turbulent-flow heat transfer in liquid metals; Power losses and initial shaft torque in a seal of frozen sodium; Calculation of the passage of fast neutrons through cylindrical channels in biological shielding; Spectrum of scattered gamma-radiation; Monte-Carlo calculation of the passage of gamma-radiation from a plane Cs-137 source through aluminum under conditions of barrier geometry; Synthesis of uranium dodecaboride; A change in the activity of fission products of U-235 and Pu-239 with time; and News of science and technology.

AD-266 831 Div. 20, 16
(TIPTB/CCH) OTS price $9.10

Belevue Medical Center, New York.
OCCURRENCE OF LENTICULAR IMPERFECTIONS IN THE EYES OF MICROWAVE WORKERS AND THEIR ASSOCIATION WITH ENVIRONMENTAL FACTORS.
Progress rept. for Feb 60-July 61,
by M. Zaret, S. Cleary and others. 27 Nov 61, 109p. incl. illus. tables.
(Contract AF 30(602)2215)
(RADC TN 61-226) Unclassified report

DESCRIPTORS: (*Microwaves, X rays, *Radiation hazards, Visual acuity, Vision, Personnel.) (*Radiation injuries, *Eye, Medical examination, Pathology, Safety.) (Tests, Errors, Statistical analysis, Mathematical analysis.) (Radar equipment, Maintenance, Hazards.)

Contents:
Description of installations surveyed
Method of opthalmological examination
Estimation of exposure histories of microwave personnel
Relationship between eye score, age, and environmental factors
Ophthalmological observations of special clinical significance
Retrospective study of cataract incidence among military personnel

AD-266 852 Div. 20
(TIPTP/MFA) OTS price $2.60

Weizmann Inst. (Israel).
NUCLEAR SPECTRA OF OXYGEN ISOTOPES,
by I. Talmi and I. Unna. 18 July 61, 21p. incl. tables (Technical note no. 4)
(Contract AF 61(052)56)
(ARL-159) Unclassified report

DESCRIPTORS: (*Radiochemistry, *Oxygen, *Isotopes, *Neutron spectroscopy.) (Nuclear shell models, Nuclear spins, Nuclear energy, Nuclei, Neutrons, Configuration.) (Mathematical prediction, Equations, Experimental data.)

The various spectra of oxygen isotopes are considered in the framework of the shell model. The low lying energy levels of these nuclei are found to be well described by jj-coupling configurations involving the 1d5/2 and 2s1/2 orbits. The predicted positions of other levels are discussed while it is stressed that some more experiments are required to make these predictions definite. (Author)

AD-266 894 Div. 20
(TIPTP/MFA) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
NEUTRON DISTRIBUTIONS NEAR AN AIR-SOIL BOUNDARY AS A FUNCTION OF SOIL-WATER CONTENT,
by R. L. Mather. 9 June 61, 25p. incl. illus.
(Rept. no. NRDL TR-530)
Unclassified report

DESCRIPTORS: (*Nuclear weapons, *Air blast, *Neutron scattering, Neutron flux density, Neutron capture, Energy, Elastic scattering.) (Air, Soils, Water.) (Experimental data, Radioactivation analysis.) (Mathematical prediction, Probability, Integration.)

A computational method developed in an earlier report, (AD-247 595), applies to the neutron field from an air-burst weapon. In this report the neutron flux as a function of energy and depth in the vicinity of the air-soil boundary at large distances from ground zero is investigated for several soil-water contents. Several aspects of the results are presented which conform with expectations. The results are briefly compared with the results from cyclotron experiments. (Author)

AD-266 941 Div. 20, 4
(TIPTP/MFA) OTS price $1.60

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech., Pasadena.
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY. THE STEREOSPECIFICITY OF THE LONG-RANGE SPIN-SPIN COUPLING IN 1,2-Dibromo-2-Phenylpropane,
by Donald R. Davis and John D. Roberts. Oct 61, 13p. illus. (Technical rept. no. 15; Contribution no. 2767)
(Contract Nonr-22026, Proj. NR 055-388)
Unclassified report

DESCRIPTORS: (*Nuclear magnetic resonance, *Microwave spectroscopy.) (*Steoreochemistry, Molecular structure, Organic compounds, Styrenes, Propanes, Bromides, Deuterium, Lithium compounds.) Nuclear spins, Nuclear magnetic moments, Experimental data.

The stereospecific long-range, proton-proton spin coupling in 1,2-dibromo-2-phenylpropane was shown by deuterium labeling to be a trans interaction. New preparations of the cis- and trans-alpha-methyl-beta-bromostyrenes and the lithium reagents corresponding thereto are described. (Author)

AD-266 956 Div. 20, 16
(TIPTB/CCH) OTS price $5.60

Linfield Research Inst., McMinnville, Oreg.
A STUDY OF THE BIOLOGICAL EFFECTS OF HIGH INTENSITY MICROSECOND PULSES OF X-IRRADIATION AS DETERMINED BY THE POST IRRADIATION TESTICULAR WEIGHT LOSS IN MICE.
Final technical rept. 1 Oct 56-30 Sep 58 and 1 Apr 59-31 Mar 60,
by J. L. Boling, R. L. Floyd, and F. M. Charbonnier. 30 Nov 61, 54p. incl. illus. 24 refs.
(Contracts DA 49-007-md-901 and DA 49-193-md-2014)
Unclassified report

DESCRIPTORS: (*X rays, Production, Dose rate, Measurement, *Radiation effects, *Radiation injuries, Laboratory animals.) Design, Theory, *Dosimeters.

The exposure of biological materials to high dose rate x-irradiation was made practicable by the recent development of T-F emmission cathodes which permit the construction of high current x-ray tubes. This report presents the design and theoretical considerations of x-ray production and dose distribtuion for a tube with a cylindrical transmission target surrounding a reentrant cavity in which material may be placed for irradiation. X-ray dose measurements at the high dose rates achieved in the reentrant cavity required the design and calibration of a suitable dosimeter. A group of 53 CAF1 mice were exposed to microsecond pulses of x-radiation at dose rates of 17.1 or 23.1 x 10 to the 6th power r/sec. Exposure was made in a single pulse or in 2, 3, or 5 pulses with 10 minute intervals between pulses. The dose-response curve for 28 day post irradiation testicular weight loss was determined. Comparison of these data with data taken from the literature for testicular weight loss following x-irradiation at relatively low dose rates suggest that the level of testicular damage induced by the high intensity x-irradiation used is roughly comparable with that reported for low intensity experiments. (Author)

AD-266 996 Div. 20
(TIPTP/WH) OTS price $1.10

Queen's U., Belfast (Gt. Brit.).
DISTORTION APPROXIMATION TO CROSS SECTIONS FOR EXCITATION OF 1s-2p TRANSITION OF HYDROGENIC IONS BY BARE NUCLEI.
1961, 6p. illus.
(Contract N62558-2637)
Unclassified report

DESCRIPTORS: (*Nuclear reactions, *Inelastic scattering, *Hydrogen, Atoms, Ions.) (Targets, Hydrogen.)

AD-267 044 Div. 20, 16
(TIPTB/CW) OTS price $2.50

New York Eye and Ear Infirmary, N. Y.
A STUDY TO DETERMINE THE RELATIVE BIOLOGICAL EFFECTIVENESS OF NEUTRONS BY CORRELATING THE PHYSIOLOGICAL CHANGES OF THE EYE TO X-RADIATION.
Rept. on Health Hazards of Materials and Radiation,
by Jerry Hart Jacobson and David L. Krohn.
Aug 61, 100p. incl. illus. tables.
(Contract AF 33(616)7127, Proj. 7165)
(ASD TR 61-415) Unclassified report

DESCRIPTORS: (*Eye, Retina, *Radiation injuries, Neutrons, X-rays, Pathology, Biochemistry, Medical examination.)

The heads of white albino rabbits were exposed to two X-ray units with differing parameters, and to pile radiation from a critical reactor, using four different moderator thicknesses. Estimations were made of the extent of tissue damage in the eyes by observations of the effects on the electroretinogram, biochemical determinations, histopathological and clinical observations, in the attempt to derive an RBE for acute retinal changes. The RBE derived for thermal neutrons at 24 hours post-radiation varied considerably with the different indicators, but appeared to be not less than 1 and not greater than 3. Higher energy neutrons appeared to have a much higher relative biological effectiveness. (Author)

AD-267 071 Div. 20, 25
(TIPTP/TL) OTS price $7.60

Colorado U., Boulder.
THE INTERACTION OF PARAMAGNETIC IONS AND ALUMINUM NUCLEI IN RUBY,
by Carl M. Verber. July 61, 69p. incl. illus. tables.
(Contract 49(638)611)
(AFOSR-1333) Unclassified report

DESCRIPTORS: (*Nuclear physics, *Ruby, Nuclear magnetic resonance, Crystals, Paramagnetic resonance, Ions, Aluminum, Nuclei.) (Atomic spectrum, Nuclear magnetic moments, Relaxation time.) (Temperature, Chromium, Diffusion, Measurement.) (*Masers, *Quantum mechanics.) Theory.

The techniques of continuous and pulsed nuclear magnetic resonance were used to study the aluminum nuclei in ruby crystals. Four commercially prepared samples having nominal chromium ion concentrations of 0.01, 0.1, 1.5, and 4% were investigated at 300, 78, 4, and 1.7 K. The line widths were found to be due to two major contributions. The mutual interaction of the aluminum nuclei contributed a constant broadening of about 7 gauss. The paramagnetic ions contributed a broadening which ranged from 0 to 42 gauss as a function of temperature, concentration and static magnetic field. This dependence can be calculated by assuming that the chromium ions have an effective magnetic moment which is determined by the Boltzman average of the four spin states of the ion at each temperature considered. This indicates that the chromium ions are in good thermal contact with the lattice down to 1.7 K. The relaxation times were found to be a strong function of the chromium ion concentration. An effort was made to predict these times, using known values of the chromium relaxation times and existing theories in which the nuclear relaxation times are given in terms of the paramagnetic relaxation times. No agreement was found between theoretical and experimental values, and a revision of existing theories is indicated. (Author)

21. NUCLEAR PROPULSION

AD-266 484 Div. 21, 30
(TIPTA/WAW) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Monthly rept. no. 8, 10 Aug-10 Sep 61.
13 Oct 61, 16p. incl. illus. tables (AID rept. 61-146)
Unclassified report

DESCRIPTORS: (*Nuclear propulsion, Instrumentation, Control.) (*Nuclear power plants, Design.) (*Gamma emission, Scintillation counters, Measurement, *Dosimeters, Design.) (*Reactor control, Control systems, Design, Mathematical analysis, Differential equations.) Technological intelligence, Translations, USSR.

Contents:
Analysis of an automatic power-level control system for a nuclear reactor
Measuring gamma radiation dose rates with a scintillation dosimeter
Experience with the first nuclear power plant

22. ORDNANCE

AD-266 215 Div. 22
(TIPTW/JRG) OTS price $9.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
EXPLOSION PHYSICS,
by F. A. Baum, K. P. Stanlukovich, and B. I. Shekhter, tr. by U. S. Joint Publication Research Service. Nov 61, 115p. incl. illus. tables (Technical notes no. FRL TN 94; Trans. of Fizika Vzryuva XII:469-554, Moscow, 1959)
Unclassified report

DESCRIPTORS: (*Shaped charges, *Explosions, *Cavity liners, Mathematical analysis.) (Shaped charges, Cavity liners, Translations, USSR.)

This selection deals mathematically with the cumulative effect of shaped charges and the jets formed from the metal liners of such charges. The cumulative effect obtained offers an appreciable increase in the local penetration action of the explosion. The effect is brought about by using charges which have a cavity on one of the ends. If such a charge is initiated from the opposite end, the explosive effect in the direction of the cavity axis is found to be much greater than if ordinary charges are used. It was established experimentally that if the surface of a cumulative cavity is covered with a relatively thin metal facing (liner) the armor-piercing action of the cumulative charge is increased many times.

AD-266 363 Div. 22, 30
(TIPTW/JRG) OTS price $1.60

Allegany Ballistics Lab., Hercules Powder Co., Cumberland, Md.
THE DIESEL-POWERED BALLISTIC CENTRIFUGE,
by Don Brown. Oct 61, 13p. incl. illus. (Rept. no. ABL/X-69)
(Contract NOrd-16640)
Unclassified report

Presented at a JANAF meeting, October 9, 1961.

DESCRIPTORS: (*Ballistics, *Centrifuges, Design.) (*Rockets, *Flight testing, *Simulation, Test equipment.) Centrifuges, *Diesel engines.

A description is given of the Allegany Ballistics Laboratory ballistic centrifuge which is used in ballistic and physical testing of rockets and rocket components. Certain flight conditions are simulated by centrifuging a rocket either ignited or unignited. Depending upon the size of the rocket or component being tested, forces up to 55 g can be applied. (Author)

AD-266 369 Div. 22
(TIPTW/JRG) OTS price $8.10

Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF CARTRIDGE, 7.62MM BLANK, NATO, XM82,
by Allen F. Schlack and John Larry Baer. June 61, 88p. incl. illus. tables (Rept. no. R-1577)
(Proj. 504-05-002)
Unclassified report

DESCRIPTORS: (*Training ammunition, *Automatic weapons for *Small arms for Design, Tests.) (Small arms ammunition, Cartridge cases, Training ammunition.)

This study is concerned with the development of a blank cartridge for the 7.62mm family of United States weapons which would accurately simulate the performance of ball ammunition. It is concluded that: (1) the short blank cartridge developed at Frankford Arsenal was unsatisfactory for use in the M60 machine gun, and (2) that Belgian, Dutch and Canadian blank cartridges function the M14 rifle and M60 machine gun satisfactorily at ambient (70 F) temperature, provided blank firing attachments having correct orifice diameter are used. It is recommended that foreign blank ammunition be used in United States 7.62mm weapons if the ammunition can be modified so as to be used with blank firing attachments compatible with the XM82 blank cartridge. (Author)

AD-266 454 Div. 22
(TIPTW/JRG) OTS price $15.50

American Machine and Foundry Co., Alexandria, Va.
STUDY AND TESTING OF RADIO FREQUENCY INSENSITIVE ELECTROEXPLOSIVE MATCHES (SQUIBS).
Final rept. 2 May 60-30 Sep 61.
Oct 61, 238p. incl. illus. tables, 36 refs.
(Contract AF 29(601)2769)
(AFSWC TR 61-88) Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, Radio frequency attenuators, *Safety devices, Tests.) (*Electromagnetic fields, *Hazards.) (Radiation effects, Countermeasures.)

In this study, the USAF is endeavoring to reduce significantly the hazards associated with the inadvertent initiation of electroexplosive devices by electromagnetic fields. A small attenuator or filter with high insertion loss and/or mismatch characteristics, preferably integral with the electroexplosive device, is considered to be the device which would best satisfy the existing and projected needs and objectives of the Air Force. High-dielectric constant capacitance units used as a shunt across squib bridgewires are thoroughly investigated over a frequency range of approximately 100 kc to 10,500 mc. The results of laboratory work and theoretical considerations are suitably reported. The feasibility of employing such units is considered to be reasonably good. (Author)

AD-266 464 Div. 22, 6
(TIPTW/JRG) OTS price $2.60

Capehart Corp., Richmond Hill, N. Y.
RF TO OPTISONIC BOLOMETER.
Quarterly technical progress rept. no. 1, 1 July-30 Sep 61,
by William B. Turner. 30 Sep 61, 21p. incl. illus. (Rept. no. 61-10-8)
(Contract N178-7914, Proj. 403)
Unclassified report

DESCRIPTORS: (*Bolometers, Measurement, Temperature, Infrared radiation, Electric detonators.) (*Electric detonators, Electromagnetic fields, Hazards, Radiofrequency.)

This study is concerned with the RF to optisonic bolometer, an instrument which will measure the susceptibility of the EED (electroexplosive device) to RF in terms of the resulting IR emission. Since the RF to optisonic bolometer is an instrument system that can measure infrared radiation, it will relate the bridge wire IR

emission to temperature. Accordingly as the EED is subjected to RF radiations of different frequencies and intensities, this bolometer will indicate approaching dangerous temperature limits. It will provide the measuring capability necessary to test, specify necessary modifications, and then re-test the electroexplosive device for its evaluation as a possible electromagnetic hazard. (Author)

AD-266 494 Div. 22, 30
(TIPTW/DLW) OTS price $9.60

Denver Research Inst., Colo.
RESEARCH AND DEVELOPMENT LEADING TO PERFECTION OF INSTRUMENTATION OF ELECTRO-EXPLOSIVE DEVICES.
Quarterly rept. no. 2, 1 July-30 Sep 61,
by D. B. Barker, R. K. Fry and others. 30 Sep 61, 114p. incl. illus. tables, 34 refs. (Rept. no. DRI 2015)
(Contract N178-7818)
Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, Thermocouples, Thermoelectricity, Detectors, Instrumentation, Test equipment.) (*Thin films, Tellurium, Bismuth, Antimonides, Contings, Microwaves, Electromagnetic waves, Absorption, Hazards, Reduction, Electric bridges, Resistance, Tests.)

Measurements of resistivity and thermoelectric power of tellurium films as a function of thickness, temperature and age are reported. Junction properties of tellurium with other materials were investigated. Two methods for measurement and control of vacuum deposition rate and film thickness and an improved vacuum deposition techniques are described. Techniques for making thin films for substrates are discussed. Comprehensive tests of bismuth-tellurium thermocouples were made and results are reported. Preliminary estimates of thermal properties of vacuum deposited thermocouples were made and thermocouple responses to step inputs of current in the Mk 1 squib were calculated. Progress of investigations of using both photoconductors and thermocouples to instrument EED's, reducing time response of thermocouples electronically and applying other types of detectors to instrumenting EED's is reported. (Author)

AD-266 532 Div. 22
(TIPTW/JRG) OTS price $2.60

Biotechnology Lab., U. of Calif., Los Angeles.
POSITION INDICATING CIRCUITRY FOR 40 mm TRACKING MOUNT,
by J. G. Kreifeldt. Aug 61, 15p. incl. illus.
(Technical note no. 24; Rept. no. 61-53)
(Contract N123(60530)23558A)
Unclassified report

DESCRIPTORS: (Tracking, Gun mounts, *Target position indicators, Circuits, *Electronic circuits.) (Targets, Tracking.) (*Tracking, Errors, Determination.)

In this study, circuitry is described which indicates the sampled instantaneous position of the azimuth and elevation carriages of the 40 mm converted gun mount used as a tracking platform. The new circuitry replaces delay multivibrators previously used for this purpose. Although more complex than the older circuits, the new circuits have the advantages of linear calibration and greater voltage input ranges. (Author)

AD-266 743 Div. 22, 10
(TIPTW/JRG) OTS price $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES.
Quarterly rept., 1 July-30 Sep 61,
by F. C. Gibson, C. R. Summers, and F. H. Scott. 30 Oct 61, 16p. incl. illus.
(ARPA Order no. 44-61)
Unclassified report

DESCRIPTORS: (*Explosives, *Propellants, *Solid rocket propellants, *Detonation, *Ignition, *Combustion.) (Explosives, High speed photography, Electric fields, Detonation waves on Velocity.) (Explosives, Detonation waves, Shock waves.) (Solid rocket propellants, Casting.)

The subjects tested during this period cover: (a) a streak photographic study of the effects of electric fields on detonation; (b) a simple plane wave generator; and (c) the procedures to be used in the casting of propellant strands.

AD-266 788 Div. 22, 25
(TIPTP/MFA) OTS price $4.60

Institute of Metals and Explosives Research, U. of Utah, Salt Lake City.
IONIZATION WAVES FROM FREE SURFACES OF DETONATING EXPLOSIVES,
by A. Bauer, M. A. Cook, and L. A. Rogers.
7 Sep 61, 44p. incl. illus. tables.
(Contract AF 18(603)100)
(AFOSR-1335)
Unclassified report

DESCRIPTORS: (*High explosive ammunition, Demolitions, Detonation waves, and *Ionization in Gases, Shock waves.) (Cameras, Photographic analysis of Explosions.) (Experimental data, Electrical conductance, Pressure, Velocity.) (Tables, Equations, Functions.)

Ionization waves ejected from the free surface of condensed high explosives in various gaseous media at ambient (about 645 mm) and 0.5 mm Hg pressures are described. Framing camera and streak camera photographs correlated with electrical conduction measurements showed a highly ionized, either highly luminous or completely transparent, precursor wave led both the shock wave and the main products of detonation propagated from the free surface. At 0.5 mm Hg this wave was transparent and non-luminous, but it always produced a burst of luminosity upon collision with the end plate of the vacuum chamber several microseconds before the opaque detonation products impacted the end plate. Measured ionization wave pressures were in general several times greater than the pressures computed by shock wave theory for the observed velocity and initial pressure and up to 20 times greater than for the shock computed by the impedance mismatch equation. The waves from the explosive free surface appear to be highly ionized material radiated from the free surface of the explosive. (Author)

AD-266 828 Div. 22
(TIPTW/JRG) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
AN EVALUATION OF THE XE-61B PRIMER, ELECTRIC,
by B. T. Cheeka. 5 Apr 61, 16p. incl. illus. tables (Rept. no. NOLTR-61-11)
Unclassified report

DESCRIPTORS: (*Electric primers, *Bomb fuzes, Tests, *Reliability, Sensitivity.)

The primer is an instantaneous electric initiator developed by the Naval Ordnance Laboratory for use in the Mk 255 Mod 0 bomb fuze. Primers were subjected to rough handling and surveillance tests to compare their characteristics under adverse conditions with those under normal conditions. Preliminary non-destructive tests; visual inspection, x-ray, and electrical resistance measurements, revealed no defects in the lot of 395 primers. Rough handling and surveillance tests had no significant effect on functioning reliability or output, but surveillance tended to widen the range of the input sensitivity levels. The thermal parameters of the bridge wire of the primer were determined. They are expected to be useful for predicting the sensitivity of the primer to electro-magnetic radiation. The subject primer proved to be outstanding with respect to over-all reliability and to withstanding extreme environmental conditioning. (Author)

AD-267 025 Div. 22, 17
(TIPTW/JRG) OTS price $3.60

Naval Weapons Lab., Dahlgren, Va.
EXPLOSIVE-INDUCED PRESSURES IN IRON,
by William G. Soper and Lester A. Potteiger.
22 Nov 61, 32p. incl. illus. tables, 13 refs,
(NWL rept. no. 1786)
(NAVWEPS rept. no. 7669)
Unclassified report

DESCRIPTORS: (*Iron, *Steel, Metal plates, *Explosions, *Load distribution, *Pressure, Determination.) (Iron, Steel, Metal plates, *Shock resistance to Explosions.) (Iron, Steel, Metal plates, Metallurgy, Shock, Hardening.) (Explosives, Detonation, Pressure, Shock waves.)

A metallographic technique is discussed for determining the level of pressure to which iron plates have been subjected by explosive loading. The interaction of the shock and rarefaction waves within the plate is analyzed to arrive at formulas from which the intensity of pressure can be determined when the velocity of the detonation front is known. This technique is employed to determine the pressure induced in iron by oblique detonation of 4 common explosives, Compositions B, C-3, C-4, and H-6. (Author)

AD-267 081 Div. 22
(TISTW/JRG) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
REDUCTION OF THE TEMPERATURE COEFFICIENT OF BALLISTICS OF 20mm AIRCRAFT AMMUNITION,
by M. E. Levy and C. W. Dittrich. Aug 61, 28p. incl. illus. tables (Rept. no. R-1600)
(Proj. 5S04-05-029)
Unclassified report

DESCRIPTORS: (*Aircraft ammunition, Small arms ammunition, Propellants, Primers, Reduction, *Ballistics, *Temperature, Tests.)

A rolled ball propellant-primer system was developed for the 20 mm M55 cartridge which exhibits a substantially lower temperature coefficient of ballistics than that obtained with the standard cartridge assembled with the unrolled WC 870 ball propellant and the M52A3B1 primer. In test action firings, the experimental cartridge yielded a velocity spread (in the range -65 to 160 F) approximately one-third that obtained with the standard cartridge. A 20 percent reduction in the pressure spread was also obtained. In the M39 automatic gun, the velocity spread obtained with the experimental ammunition in this temperature range was approximately half that obtained with the standard. (Author)

23. PERSONNEL AND TRAINING

No Entries

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-266 612 Div. 24
(TIPTB/LH) OTS price $6.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
PROJECTION SCREENS FOR DATA PRESENTATION,
by Edward R. McGraw, Jr. Oct 61, 59p. incl. illus. tables (Rept. no. RADC TR 61-199)
(Proj. 5578)
Unclassified report

DESCRIPTORS: (*Motion picture screens, Surface properties, Optical analysis, Optics, Theory, Analysis, Configuration, Standardization.)

The goal of this report is to present sufficient theory and practical information to enable a clear understanding of the problems involved concerning large area (3 ft x 4 ft and larger) projection displays. Various screen types are described and measurement data is presented. While this study does not represent a comprehensive analysis of all available projection screens, it does treat examples of nearly every type of screen as well as the technical aspects of principal importance. (Author)

AD-266 815 Div. 24
(TIPTB/LH) OTS price $1.10

Continental Army Command, Fort Monroe, Va.
USCONARC-APPROVED MILITARY CHARACTERISTICS FOR MOBILE TACTICAL PHOTOGRAPHIC LABORATORY, GENERAL PURPOSE (ES-35 AND ES-36 COMBINED).
29 Nov 61, 9p.
Unclassified report

DESCRIPTORS: (Laboratories, *Photographic equipment, Mobile.) (*Military requirements, Reliability.)

Efforts were directed toward development of a mobile photographic laboratory capable of

processing exposed film from aerial and ground sensory devices; processing exposed film from tactical sources including reconnaissance, intelligence, operational record, public information and miscellaneous; and producing high quality imagery from roll and cut sheet film. Operational, maintenance, and safety considerations are outlined.

AD-266 919 Div. 24
(TIPTP/MFA) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
IMAGE ORIENTATION CAMERA,
by Leroy Goldfarb. Aug 61, 17p. incl. illus. (ASRDL Technical rept. no. 2222)
Unclassified report

DESCRIPTORS: (*Aerial reconnaissance, Aerial photographs, Surveillance drones, *Cameras, Test equipment, Design.) (Photographs, Photographic analysis, Photographic equipment.)

The interpretation of aerial photographs is becoming increasingly more difficult with the use of high performance vehicles and camera equipment. An approach to the problem from the sensor aspect is discussed. Basically the camera utilizes two focal length lenses imaging at the same time, on the same film side by side. The large angular coverage of the short focal length lens aids in orienting the image produced by the longer focal length lens. (Author)

25. PHYSICS

AD-266 109 Div. 25
(TIPTP/WH) OTS price $16.00

David Sarnoff Research Center, Princeton, N. J.
ELECTRONIC SPECTRA OF TRANSITION METAL IONS IN CRYSTALS.
Final rept.,
by Donald S. McClure, Santiago R. Polo, and Herbert A. Weakliem. 1 June 61, 1v. incl. illus. tables.
(Contract AF 19(604)5541)
(AFCRL-555(1)) Unclassified report

DESCRIPTORS: (Crystals, *Metallic crystals, Ions.) (Crystal structure, *Electron transitions, Atomic spectrum, Resonance absorption, Polarization, Magnetic susceptibility.) (Single crystals, *Corundum, Chemical impurities, Chromium, Cobalt, Manganese, Nickel, Titanium, Vanadium.) (Experimental data, Tables.) *Bibliography, Spectrophotometers.

This report includes:
OPTICAL SPECTRA OF TRANSITION METAL IONS IN CORUNDUM, by Donald S. McClure. 1961, 67p. illus.

OPTICAL SPECTRA OF Ni++, Co++, and Cu++ IN TETRAHEDRAL SITES IN CRYSTALS, by Herbert A. Weakliem. 1961, 47p. illus. tables.

THE OPTICAL ABSORPTION SPECTRUM OF NiSiF6.6H2O, by Donald S. McClure. 1961, 14p. illus. table.

EXCHANGE COUPLED Mn++ IONS IN ZnS SINGLE CRYSTALS, by Donald S. McClure. 1961, 11p. illus. tables.

AD-266 112 Div. 25, 9
(TIPTP/MFA) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
PROPAGATION PROPERTIES OF NONUNIFORM IONIZED MEDIA,
by Gerald Levy. Oct 61, 24p. incl. illus.
(RADC TN-61-99; Proj. no. 5561)
Unclassified report

DESCRIPTORS: (*Electromagnetic waves, *Gas ionization, Plasma oscillations, Wave transmission, Electromagnetic fields, *Transport properties, Kinetic theory, Plasma physics, Ionosphere, Attenuation, Pulse analyzers.) (Equations, Integral transforms, Bessel functions, Harmonic analysis.)

The behavior of plane electromagnetic waves in ionized gaseous media is attributed to the dispersion caused by the oscillation of the free electrons and the dissipation caused by the collision of these electrons with neutral particles during their oscillations. Further, since plasma media normally encountered in practice is nonuniform and bounded, the effects of these properties upon the energy propagation are also considered. Both monochromatic and pulse signal transfer function of plasma media are studied. Finally, a method of approximation of a general electron density by multiple constant gradient slabs matched at their interfaces is suggested. (Author)

AD-266 128 Div. 25, 7
(TIPTM/TCG) OTS price $8.60

David Sarnoff Research Center, Princeton, N. J.
THERMOELECTRIC MATERIALS FOR POWER CONVERSION,
Quarterly progress rept. no. 8 (Final) 1 Apr 59-31 Jan 61,
by B. Abeles, G. D. Cody and others. 15 Feb 61, 92p. incl. illus. tables.
(Contract NObs-77057)
Unclassified report

DESCRIPTORS: (*Thermoelectricity, *Semiconductors, *Electric power production, Materials.) (Intermetallic compounds, Bismuth alloys, Tellurium alloys, Rare earth compounds, Silicides, Sulfides, Germanium, Silicon, Indium compounds, Thermal diffusion, Thermoelectricity, Thermocouples, High temperature research, Measurement.) (Solids, Solutions, Selenium alloys, Antimony alloys.) (Crystal structure, Synthesis, Complex compounds, Silver alloys, Lattices, Thermal conductivity.) Sandwich construction, Alloys.

Materials research on Bi telluride alloys, ternary compounds, silicides and sulfides is described. The measurements of thermal diffusivities of semiconductors at high temperatures are described with efficiency measurements on power generating thermocouples. Measurements of the temperature dependence of thermoelectric properties on a number of solid solution alloy systems showed that solid solution alloys of Bi_2Te_3 with Bi_2Se_3, Sb_2Te_3 and Sb_2Se_3 provided the best p- and n-type material for thermocouple operation in the temperature range 25 to 250 C. A large number of ternary compound semiconductors having the cubic structure were synthesized and those, such as AgSbTe2, with the rock salt structure are characterized by low lattice thermal conductivities. AgSbTe2 and its alloys with GeTe provided p-type materials useful for power generation in the range 250 to 550 C. (Author)

AD-266 184 Div. 25, 5
(TIPTP/MFA) OTS price $2.60

Space Technology Labs., Inc. Los Angeles, Calif.
ON RADIATION IN A RANDOMLY INHOMOGENEOUS MEDIUM,
By William C. Meecham. Sep 61, 23p. (Rept. no. 6120-0040-RU-000)
(Contract AF 04(694)1)
(BSD TR 61-36)
Unclassified report

DESCRIPTORS: (*Electromagnetic waves, *Wave transmission, Propagation, Scattering, *Ionosphere, Turbulence.) (Radio signals, Communications theory, Electrons, Density, Particles, Targets.) (Green's function, Integral equations, Integration.)

The point source solution in a random inhomogeneous medium is considered. It is found that energy is transferred from the average to the fluctuation field at a rate dependent upon the long wave length components of the random fluctuation in the medium. The phase velocity of the average solution is lowered. Both of these characteristics are dependent to lowest order on second order scattering processes, single scattering producing no average effect. The behavior of the average solution is directly analogous to the result for propagation in a medium composed of discrete scatterers placed at random. An example is worked out using a Gaussian correlation function for the medium fluctuation; both the change in the phase velocity and the rate of energy loss from the average beam are found. (Author)

AD-266 198 Div. 25, 8
(TIPTP/MFA) OTS price $1.60

University of Southern Calif. Engineering Center, Los Angeles.
SURFACE WAVES ON A PLASMA-CLAD CYLINDER,
by Willard Van Tuyl Rusch. Sep 61, 15p. incl. illus. (Rept. no. USCEC 82-202)
(Contract AF 19(604)6195)
(AFCRL-903) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Excitation, Surface properties, *Plasma physics, Structures, *Cylindrical bodies, Dielectrics.) (Numerical analysis, Computers, Equations.)

Propagation constants have been computed for both axially-symmetric and hybrid surface waves on an infinite, plasma-clad, circular cylinder. If the plasma is lossless, the propagation constants are pure real, and the surface waves propagate unattenuated in the axial direction but decay exponentially in the radial direction. The phase velocity of the surface waves is less than the velocity of light in the surrounding medium. (Author)

AD-266 201 Div. 25, 4
(TIPTM/EJH) OTS price $2.60

Uppsala U. (Sweden).
VIRIAL THEOREM AND COHESIVE ENERGIES OF SOLIDS, PARTICULARLY IONIC CRYSTALS,
by A. Froman and P. O. Lowdin. 15 Sep 60, 23p. incl. tables (Technical note no. 51)
(Contract AF 61(052)351)
(ARL-165) Unclassified report

DESCRIPTORS: (Solids, *Solid state physics, *Crystals, Molecules, Atoms, *Ions, Chemical bonds, Adhesion, Quantum mechanics, Energy, Atomic energy levels, Atomic orbitals, Theory.) (*Alkali metal compounds, *Halides, Lithium compounds, Chlorides, Hydrides.)

The importance of the virial theorem for the cohesive energies of solids is discussed. An interpretation of the cohesive energy independent of any particular model is proposed, taking into account the increase in the kinetic energy which follows when a compound is formed. The empirical cohesive energies of the alkali halides obtained from the Born-Haber cycle are used in making this interpretation, and a comparison is made with alternative interpretations. The quantum mechanical treatment of the cohesive energy is also discussed. A detailed numerical study has been carried out for LiCl. (Author)

AD-266 240 Div. 25, 12
(TIPTW/JRG) OTS price $1.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
SOUND PROPAGATION THROUGH A WINDY ATMOSPHERE,
by Henry Rachele. Oct 61, 11p. incl. illus. (Technical rept. no. 109)
Unclassified report

DESCRIPTORS: (Mathematical analysis of *Sound transmission, Atmosphere, Wind, Meteorology.) (*Sound, *Refraction, Atmosphere, Mathematical analysis.) (*Rockets, *Motion, Differential equations, Mathematical analysis.) Snell's law, Atmospheric refraction.

Snell's equations, and variations thereof, for the refraction of sound in a temperature-stratified medium are derived from a ballistic standpoint. The equations are then transformed for ray tracing through a windy atmosphere. (Author)

AD-266 243 Div. 25, 17
(TIPTM/BRW) OTS price $2.60

Illinois U., Urbana.
THE ZENER RELAXATION IN TERNARY Au-Ag-Zn ALLOYS,
by Amand Pirson and Charles Wert. 3 July 61, 13p. illus. tables.
(Contract AF 49(638)672)
(AFOSR-1112)
Unclassified report

DESCRIPTORS: (Phase studies, *Gold alloys, *Silver alloys, *Zinc alloys, Crystal structure, Lattices, Phase transitions, Relaxation time, Measurement.) (Test methods, Internal friction, Low frequency.) Solid state physics, Alloys.

Well-formed Zener damping peaks were observed in ternary alloys of Au, Ag and Zn. The relaxation strength across the ternary along a line of constant Zn concentration of 15 at.-% goes through a maximum at about an equal ratio of Au to Ag. This maximum is large, being nearly 3 times what might have been expected by averaging the effects of the 2 binaries. The relaxation strength at low concentration of Zn for an alloy of equal ratio of Au to Ag increases as the square of the Zn concentration, as is true for binary alloys. (Author)

AD-266 258 Div. 25, 4
(TIPTM/GEC) OTS price $1.60

Cornell U., Ithaca, N. Y.
CRITICAL OPALESCENCE OF POLYSTYRENE IN ETHYL CYCLOHEXANE,
by P. Debye and B. Chu. 30 Apr 61, 6p. illus. table (Technical rept. no. 6)
(Contract Nonr-40117)
Unclassified report

DESCRIPTORS: (*Polymers, *Styrenes in Ethyl radicals, *Cyclohexanes, Temperature, Phase studies, *Light transmission, Refracture index.) (Light, Scattering, Mathematical analysis, Theory.)

The range of molecular forces and the critical temperature of polystyrene in ethyl cyclohexane are calculated from measurements of the angular dependence of critical opalescence. The polystyrene samples have molecular weights ranging from 69,000 to 552,000. The range of molecular forces remains strikingly small and is comparable with values obtained earlier on the system polystyrene-cyclohexane. (Author)

AD-266 259 Div. 25
(TIPTM/GEC) OTS price $1.60

Cornell U., Ithaca, N. Y.
VISCOSITY OF CRITICAL MIXTURES,
by P. Debye and B. Chu. 15 Nov 61, 16p. incl. illus. tables, 13 refs. (Technical rept. no. 7)
(Contract Nonr-40117, Proj. NR 051-360)
Unclassified report

Prepared for publication in the Jnl. of Polymer Science.

DESCRIPTORS: (*Polymers, *Styrenes, *Cyclohexenes, *Viscosity, Solutions, Mixtures, Temperature, Phase studies, Molecular structure, Light.)

Measurements of the viscosity of critical mixtures were extended to high polymer solutions (polystyrene-cyclohexane). An anomaly is found in the temperature coefficient of the viscosity. An empirical expression for the viscosities of critical mixtures as a function of delta T/T sub c (delta T equals T - T sub c; T sub c is the critical temperature) is derived. (Author)

AD-266 260 Div. 25
(TIPTP/MFA) OTS price $1.60

Antenna Lab., Calif. Inst. of Tech., Pasadena.
THE INCOHERENT SCATTERING OF ELECTROMAGNETIC WAVES BY FREE ELECTRONS,
by C. H. Papas and K. S. H. Lee. Aug 61, 14p. incl. illus. (Technical rept. no. 26)
(Contract AF 18(600)1113)
(AFOSR-1330) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Plasma physics, *Ionosphere, Differential cross section, *Elastic scattering, Scattering, Electrons, Wave transmission, Density, Velocity, Polarization, Linear systems.) (*Equations, Transformations (Mathematics).)

The incoherent scattering of an electromagnetic wave by free electrons is examined theoretically. Under the assumption that the electrons have a Maxwellian velocity distribution, the scattered power and its frequency spectrum are calculated. The applicability of these results of ionospheric and laboratory plasmas is discussed. (Author)

AD-266 266 Div. 25, 9
(TIPTP/MFA) OTS price $2.60

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
THE DIFFUSIONAL CONTRIBUTION TO THE KNUDSEN CELL EFFUSION FLUX,
by W. L. Winterbottom and J. P. Hirth. 1961, 25p. incl. illus. tables, 20 refs.
(Contract Nonr-76017)
Unclassified report

DESCRIPTORS: (Diffusion, *Gas diffusion, Kinetic theory, Vapor pressure, Orifices, Cylindrical bodies, Molecular structure, Transport properties.) (*Mathematical prediction, Probability.) (Experimental data, Design, Measurement, Tables.)

It is recognized that the geometry of a Knudsen vapor effusion cell influences the kinetics of the molecular effusion of the vapor from within the cell. Clausing, Whitman and Motzfeldt have given treatments which allow for the correction of the effusion flux to account for these factors so that the flux obtained will reflect the actual vapor pressure within the cell. However, no treatment has been reported of the contribution to the effusion flux made by the surface diffusion out through the orifice of the effusate adsorbed on the cell walls. Treating the steady state kinetics for both surface diffusion and vapor effusion out through the orifice the applicable differential equations for this model were solved approximately. Although the required thermodynamic data is sparse, the derived relations indicate the diffusion flux for the orifice dimensions commonly employed may contribute an appreciable fraction of the total weight loss of the cell during an effusion experiment. If not taken into account this diffusional contribution would yield equilibrium vapor pressures in excess of the actual values. (Author)

AD-266 274 Div. 25
(TIPTM/GEC) OTS price $4.60

General Electric Co., Schenectady, N. Y.
RESEARCH ON CdTe.
Quarterly progress rept. no. 2, 1 Aug-31 Oct 61, by R. E. Halsted, M. R. Lorenz, and D. T. F. Marple. 31 Oct 61, 46p. incl. illus. tables, 17 refs.
(Contract AF 33(616)8264)
Unclassified report

DESCRIPTORS: (*Semiconductors, *Single crystals, Intermetallic compounds, *Cadium compounds, *Tellurides, Optics, Refractive index, Reflection, Monochromatic light, Phase studies, Temperature, Presssure, Melting, Crystals, Zone melting, Solid state physics.

This report includes:
PHASE EQUILIBRIA IN THE SYSTEM Cd-Te, by M. R. Lorenz. 1961, 21p. incl. illus. tables.

Studies continued of the optical properties of CdTe and of phase equilibria in the Cd-Te system. Results have been obtained which characterize CdTe and have contributed new information relevant to semiconductors in general. The optical studies have found what may prove to be the first experimental evidence for off-zone-center excitons. The phase equilibria study has provided the first clear exposition of the existence and consequences of a maximum controlled component pressure in compound semiconductors. (Author)

AD-266 275 Div. 25, 9
(TIPTP/MFA) OTS price $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
VELOCITY PROFILES AND EFFICIENCY OF MHD GENERATORS WITH SEGMENTED ELECTRODES,
by H. Yeh and G. W. Sutton. 15 Sep 61, 30p. incl. illus. (Rept. no. R61SD150)
(Contract AF 49(638)914)
(AFOSR-1595) Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Generators, Electrodes, Fluid flow, Conductivity, *Velocity, Laminar boundary layer, Magnetic fields, Hall effect.) (Equations, Differential equations, Transformations (Mathematics), Integrals.)

The two-dimensional problem of an infinitely long magnetohydrodynamic generator with segmented electrodes of finite length was solved for constant properties, including the Hall effect. First, it was shown that the non-uniform current distribution does not affect the velocity profile, which is therefore parabolic for laminar flow. Second, the generator efficiency (not including friction) is exactly equal to the generator loading factor even for a non-uniform velocity. In these investigations it was assumed that opposite pairs of electrodes have no mutual influence. This assumption has been verified when the Hall effect is absent even when the electrode pitch is equal to channel width. (Author)

AD-266 282 Div. 25
(TIPTM/GEC) OTS price $5.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
VAPOR PHASE GROWTH OF SILICON.

Final rept., 1 Aug 60-31 July 61,
by H. J. Beatty, R. Glang and others. 31 July 61, 53p. incl. illus. tables (Rept. no. 8)
(Contract DA 36-039-sc-87395; Continuation of Contract DA 36-039-sc-84547)
Unclassified report

DESCRIPTORS: (*Silicon, Single crystals, *Semiconductors, *Transistors, Thin films, Growth, Deposits, Chemical impurities, Crystal structure.) (Disproportionation, *Silicon compounds, Iodides.) (Reduction, Silicon compounds, *Silanes, Hydrogen.) (Silanes, Chlorides.) Vapors.

A study was made of the growth of silicon single crystalline layers from the vapor phase. The process parameters of 3 chemical systems have been studied and correlated with the characteristics of the grown layers. The limitations of the SiI2 disproportionating reaction were pointed out and showed the advantages of an open-tube type of configuration. The SiI4 - H2 reduction system permitted epitaxial silicon deposits with better crystal perfection and smoother surface topographies than in the closed-tube SiI2 method. The trichlorosilane system was most adapt for a controllable deposition process. The quality and properties of vapor grown silicon films have been found to depend on many process parameters in a complex pattern. Controlled impurity doping with N and P type conductivity was accomplished for a wide resistivity range. (Author)

AD-266 283 Div. 25
(TIPTP/MFA) OTS price $4.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
DIRECT CONVERSION--THERMAL TO RADIO-FREQUENCY ENERGY.
Final rept.,
by Joseph F. Colwell and Hugh Garvin. 31 Oct 61, 44p. incl. illus. tables (Rept. no. GA-2535)
(Contract AF 30(602)2437, Proj. 4519)
(RADC TR 61-244) Unclassified report

DESCRIPTORS: (*Thermal radiation, Thermoelectricity, *Energy, Electrostatics, Plasma physics, *Radiofrequency, Plasma oscillations, Electromagnetic waves, Cesium.) (Radio signals, Diodes, Radiofrequency spectrum analyzers, Radiofrequency power, Electric potential, Thermionic emission.) (Experimental data, Photographic analysis, Tables, Equations, Functions, Integration.) (Electromagnetic waves, Generators, Plasma physics.)

An analytical and experimental program was carried out to determine the parameters for utilizing the cesium-vapor diode as a direct converter of thermal energy to electromagnetic energy in the radiofrequency (rf) range above 50 Mc/sec. The theoretical study concerned the plasma conditions which exist in a cesium diode with parallel-plane geometry, and predictions were made of the nature of the oscillatory plasma modes which might couple to a radiation field. The experimental program sought to determine if rf signals (above 50 Mc/sec) could be observed to emanate from a cesium-vapor diode. Signals were observed in the kilomegacycle frequency range which were found to depend critically on conditions of plasma temperature and density. The energy content is judged to be of the order of KT; the frequency was within 30% of the calculated plasma frequency. (Author)

AD-266 284 Div. 25
TIPTP/MFA) OTS price $4.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
A FIRST-ORDER MAGNETOHYDRODYNAMIC STOKES FLOW,
by Vivian O'Brien. June 61, 40p. incl. illus.
(Rept. no. CM-997)
(Contract NOrd-7386)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Spheres, Fluid flow, Conductivity, Plasma physics, Electromagnetic fields, Gas ionization, Magnetic properties, Viscosity, Drag.) (Equations, Perturbation theory, Partial differential equations.)

The first-order magnetohydrodynamic (MHD) flow of an incompressible conductive fluid about a small rigid sphere moving slowly in the direction of a uniform magnetic field was calculated. A perturbation stream-function was computed from the zero-order velocity and magnetic fields which enables one to evaluate the increase in drag due to the interaction between the two fields. The drag increase is proportional to the square of the Hartmann number and is a simple multiple of the Stokes drag value. Though the analysis is limited to very low Hartmann numbers, the extension of the present method to higher magnetic fields and also to similar axi-symmetric MHD problems is discussed. (Author)

AD-266 299 Div. 25
(TIPTP/MFA) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
DYNAMIC RESPONSE OF SYSTEMS WITH STRUCTURAL DAMPING,
by Stephen H. Crandall. Oct 61, 19p. illus.
(Contract AF 49(638)564)
(AFOSR-1561) Unclassified report

DESCRIPTORS: (*Vibration mechanisms, *Structures, *Damping, Linear systems, Elasticity, Flutter, Oscillation, Excitation.) (Communications theory, Numerical analysis, Integral transforms.)

The response of simple vibratory systems containing structural damping is studied analytically when the excitation is an impulse and when the excitation is stationary random vibration. It is found that in a strict sense the assumption of ideal structural damping represents a physically unrealizable model because a small precursor response occurs before the application of an impulsive load. For stationary random excitation exact solutions for the mean square response are compared with approximate solutions obtained from two increasingly accurate equivalent viscous substitutes for structural damping. (Author)

AD-266 306 Div. 25, 6
(TIPTN/RD) OTS price $4.60

Naval Ordnance Test Station, China Lake, Calif.
MEASUREMENTS OF THE INFRARED REFLECTING PROPERTIES OF BEADED SCREENS,
by L. L. Collins and L. W. Nichols. 5 Apr 61, 45p. incl. illus. table (Rept. no. NOTS TP 2640)
Unclassified report

DESCRIPTORS: (*Infrared radiation, *Reflection, Diffraction, Scattering.) (*Infrared radiation, Measurement, Sources.) (*Grilles, Reflection, Infrared radiation.) (Radiometers, Lead compounds, Sulfides, Photomultipliers.)

The reflecting properties of several beaded surfaces have been studied in the 0.3- to 6.0-micron spectral band. Quantitative results are shown for studies of spectral reflectance, effects of angle-of-incidence, and effects of range on radiation return. (Author)

AD-266 321 Div. 25, 2, 8
(TIPTP/MFA) OTS price $1.60

Microwave Lab., Stanford U., Calif.
GENERATION OF RADIO NOISE IN THE VICINITY OF THE EARTH.
Technical note,
by P. A. Sturrock. Sep 61, 12p. (ML rept. no. 840; Stanford Radio Astronomy Inst. Pub. no. 19)
(Contract AF 49(638)342)
(AFOSR-1427) Unclassified report

DESCRIPTORS: (*Earth, *Noise, *Extraterrestrial radio waves.) (Particles, Energy, Van Allen radiation belt, Cerenkov radiation, Interstellar matter.) (Shock waves, Plasma oscillations, Wave transmission, Elastic scattering, Solar noise, Solar disturbances, Gas ionization.)

A tentative classification of possible sources of radio noise in the vicinity of the earth may be obtained by examining separately available sources of power and known mechanisms for conversion of this power. Among the former we may list high-energy electrons such as those trapped in the Van Allen belts; the solar wind; bursts of high-energy particles ejected by the sun; shock waves in the interplanetary medium originating on the sun; and the rotational energy of the earth. Mechanisms of conversion may be classified as direct, such as synchrotron and Cerenkov radiation, and indirect. Indirect conversion involves the excitation of an intermediate state by the available sources of power and subsequent radiation by this state. This intermediate state may be localized heating, the formation of unstable current patterns, the acceleration of particles, or the generation of waves which are themselves nonradiative, such as plasma oscillations. The following mechanisms which are relevant to the generation of radio noise receive special attention: Cerenkov radiation, two-stream instability, and the coupling of waves by inhomogeneity and nonlinearity. (Author)

AD-266 327 Div. 25, 4, 17
TIPTM/GEC) OTS price $2.60

Israel Inst. of Tech., Haifa.
LONG-RANGE ORDER IN Fe RICH Fe-Al ALLOYS. IV: AN X-RAY DIFFRACTION STUDY,
by U. Shmueli and P. S. Rudman. July 61, 30p. incl. illus. table, 20 refs. (Scientific note no. 7)
(Contract AF 61(052)122)
(ARL-173) Unclassified report

DESCRIPTORS: (Alloys, *Aluminum alloys, *Iron alloys, *X-ray diffraction analysis, Crystals, Transformations, Heat treatment, Diffraction, Single crystals, *Crystal structure.)

Long-range order was studied as a function of quenching temperature by x-ray diffraction integrated intensity measurements from a polycrystalline sheet (25 at-% Al) and from a single crystal (29 at-% Al). FeAl type order was independent of the quenching temperature from which it is concluded that maximum possible order had been attained. Fe3Al type order decreased continuously with increasing quenching temperature indicating a second order transformation for FeAl order in equilibrium with Fe3Al order. The critical temperatures for this latter transformation were 558 C (25% Al) and 545 C (29% Al). Only about 80% of the maximum possible Fe3Al order was attained for the 29% alloy. No absolute determination was made for the 25% alloy. Broadening of the Fe3Al order, 111 superstructure line was observed and interpreted as due to particle size broadening from anti-phase domains. This is apparently the first direct evidence of growth anti-phase domains in BCC-based ordering systems. (Author)

AD-266 345 Div. 25, 17
(TIPTM/EJH) OTS price $2.60

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
COMBINED STRESSES IN AN ORTHOTROPIC PLATE HAVING A FINITE CRACK.
Rept. for June 58-Dec 60 on Mechanics of Flight,
by D. D. Ang and M. L. Williams. July 61, 21p. incl. illus. 13 refs.
(Contract AF 33(616)5740, Proj. 7063)
(ARL-22) Unclassified report

DESCRIPTORS: (*Solids, *Metal plates, *Fracture (Mechanics), Failure (Mechanics), *Deformation, Stresses, Mathematical analysis, Integral equations, Differential equations, Theory.)

By using a formulation in integral equations, a solution for the combined extension-classical bending stress and displacement solution is presented for the case of an infinite orthotropic flat plate containing a finite crack. Primary emphasis is placed upon the stresses near the crack point. Qualitatively no major difference in behavior due to orthotropy was found, certain quantitative features are noted, mainly as a function of the characteristic rigidity ratio (E sub x/E sub y) to the 1/2 power. The inverse square root character of the isotropic stress bending and extension is not changed by orthotropy, although amplitudes and distribution are affected. Account is taken of recent work of Knowles and Wang (GALCIT SM 60-11, July 1960) dealing with Reissner bending of the plate in deriving a bending-extension interaction curve for fracture initiation. The interaction is linear if an octahedral shearing stress criterion is used. (Author)

AD-266 365 Div. 25, 9
(TIPTP/MFA) OTS price $7.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
DEVELOPMENT OF A SHOCK-TUBE DRIVEN MOLECULAR BEAM,
by George T. Skinner. Oct 61, 64p. incl. illus.
(Rept. no. RM-1396-A-1)
(AFOSR-166) Unclassified report

DESCRIPTORS: (*Molecular beams, *Shock tubes, Gas flow, Particles, Heat transfer, Energy, *Transport properties, Differential cross sections, Elastic scattering.) (Design, Tests, Experimental data.) (Instrumentation, Hypersonic nozzles, Oscilloscopes, Orifices, Tanks, Targets, Detectors.) (Equations, Analysis.)

The preliminary development of a high intensity molecular beam, in which a small tailored-interface hypersonic shock-tunnel is used as the gas source, is reported. The aim is to extend molecular beam techniques into the 1-10 e.v. per particle range by utilizing the capability of the shock tube to generate high temperatures. A 0.7 e.v. nitrogen beam was produced in the pilot apparatus. The intensity of 2.5 x 10 to the 18th power molecules 1/sq.cm./sec. and the spreading angle of 6 deg agree with a theoretical analysis which takes into account attenuation caused by scattered molecules which have been thermally accommodated at the walls of the apparatus. A modified Kantrowitz-Grey system is used to obtain the high-energy beam. (Author)

AD-266 374 Div. 25, 12, 1, 27
(TIPTM/BRW) OTS price $26.00

Minnesota U., Minneapolis.
WADC-UNIVERSITY OF MINNESOTA CONFERENCE ON ACOUSTICAL FATIGUE.
Rept. for 29 Sep-2 Oct 59 on Materials Analysis and Evaluation Techniques,
ed. by W. J. Trapp and D. M. Forney, Jr. Mar 61, 494p. incl. illus. tables.
(Contract AF 33(616)5426, Proj. 7360)
(WADC TR 59-676) Unclassified report

DESCRIPTORS: (*Conferences, *Fatigue (Mechanics), Materials, Structures, *Acoustics, Applied mechanics.) (Noise, Jet engine noise, Vibrations, Damping in Joints and Airframes.) (Gas flow, Turbulence, Pressure, Boundary layer.) Design.

Contents: Introduction to acoustical fatigue; Types of pressure fields of interest; Correlation of pressures around a jet engine; Use of correlation techniques to determine the forms of vibration of a continuous structure excited by random pressures; Statistical properties of a pressure field in a turbulent boundary layer; Fatigue of materials and structures under random loading; Statistical aspects of acoustical fatigue; Review of structural damping mechanisms; Development of vibration damping materials; Damping of simplified configurations with additives or interfaces; Damping, stiffness, and fatigue properties of joints and configurations representative of aircraft structures; Determinate and random excitation of lumped-linear structures; Excitation of distributed systems; Acoustic damping mechanisms; Design considerations for minimizing acoustic fatigue; Acoustical fatigue test procedures used in aircraft industry and their limitation; External noise environments of flight vehicles; A new look at structural peak distributions under random loading; Use of model jets for studying acoustic fields near jet and rocket engines; Experimental results from evaluation of constrained damping layer structures; and Quick estimation of damping from free damped oscillograms.

AD-266 382 Div. 25, 17
(TIPTA/SEB) OTS price $13.00

Minnesota U., Minneapolis.
VISCOELASTIC BEHAVIOR OF SURFACES OF REVOLUTION UNDER COMBINED MECHANICAL AND THERMAL LOADS.
Rept. on Mechanics of Flight,
by L. Albert Scipio, II, Sze-Foo Chien and others. May 61, 168p. incl. illus. tables, 25 refs.
(Contract AF 33(616)5723, Proj. 7063)
(ARL TR 60-305) Unclassified report

DESCRIPTORS: (*Conical bodies, *Hemispherical shells, Bodies of revolution, Mechanical properties, Thermal stresses, Stresses, Load distribution, Thermal expansion, Viscosity, Elasticity, Mechanics, Tests, Mathematical analysis, Differential equations, Test methods, Test equipment, Theory.) (Aluminum, Aluminum alloys.)

Results are presented of an analytical and experimental study of thin conical and hemispherical shells subjected to combined mechanical and thermal loads. The analytical solutions are applicable for shells constructed from a linear viscoelastic material with temperature dependent properties. Experimental models were subjected to various constant radiant heating rates to various steady-state temperatures. In some cases a constant normal pressure was combined with the thermal load. Theoretical values for the meridional and circumferential stress distributions based on a visoelastic analysis (both temperature independent and temperature dependent material porperties) and the elastic analysis are compared with experimental results for typical time intervals during the transient and steady-state periods. A variational equation based on energy principles was developed for thin hemispherical shells. The Ritz method is applied by assuming that the shell displacements are functions of the curvilinear shell coordinates and that unknown coefficients are functions of time. (Author)

AD-266 394 Div. 25
(TIPTP/MFA) OTS price $3.60

Tufts U., Medford, Mass.
VIBRATIONAL SPECTROSCOPY IN OPTICS AND SPECTROSCOPY,
by D. E. Freeman. 1 Nov 61, 35p. incl. table.
(Scientific rept. no. 2)
(Contract AF 19(604)4063)
(AFCRL-917) Unclassified report

DESCRIPTORS: (Vibration, *Infrared spectroscopy, Optics, Spectrographic analysis, Chemicals, Molecules, Inorganic substances, Organic compounds, Analysis.) (Transformation (Mathematics), Matrix algebra.) (*Bibliography, USSR, Literature.) Tables.

Since 1959, when the Optical Society of America commenced cover-to-cover translation of the Russian journal, Optika i Spektroskopiya, the translated version, Optics and Spectroscopy, has contained about 150 articles in the field of vibrational spectroscopy. The quality of the translations is high and merits the close attention of spectroscopists. This review, dealing with the period from January, 1959 until March, 1961, is not intended to be exhaustively comprehensive but is focussed on selected topics, so that some articles, especially those of a more empirical nature, are omitted. (Author)

AD-266 395 Div. 25, 15
(TIPTP/GRW) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
THE EIGENVECTORS OF THE ANGULAR MOMENTUM OPERATOR Jx,
by J. L. Brenner, P. A. Clement, and F. T. Smith. Aug 61, 13p. (Technical summary rept. no. 257)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Quantum mechanics, *Matrix algebra, Theory.

A matrix M which arises in the theory of angular

momentum in quantum mechanics, is discussed. The fact that M can be transformed into diagonal form by a symmetric real orthogonal matrix is established. Certain inner products of eigenvectors, and certain weighted inner products are computed also. That the methods and results do apply to a certain narrow class of matrices related to M is indicated. (Author)

AD-266 398 Div. 25, 12
(TIPTP/WH) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
INSTRUMENTATION FOR MAGNETOAERODYNAMIC HEAT TRANSFER,
by Richard W. Ziemer. 8 Sep 60, 35p. incl. illus. (Rept. no. STL/TR-60-0000-09290)
(Contract AF 04(647)309)
Unclassified report

DESCRIPTORS: (Hypersonics, *Magnetohydrodynamics, Re-entry aerodynamics, *Superaerodynamics, Re-entry vehicles, Gases, Gas ionization.) (Gases, *Hypersonic flow, *Cooling, Magnetic fields, Measurement, Instrumentation, Thermal radiation.) (Re-entry vehicles, Guided missile noses, Cooling.)

An experimental technique is described for directly measuring the stagnation point heat transfer rate to an aerodynamic model in an electromagnetic shock tube. The application to measuring the reduction in aerodynamic heating by magnetoaerodynamic means is specifically considered. Development of the instrument is discussed, and successful results of preliminary experiments are reported. The technique was found practical for magnetoaerodynamic heat transfer measurements and could be used to study radiative heat transfer from ionized gases. Recommendations for future research are presented. (Author)

AD-266 399 Div. 25
(TIPTP/WH) OTS price $4.60

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE LAMINAR COMPRESSIBLE BOUNDARY LAYER IN THE PRESENCE OF AN APPLIED MAGNETIC FIELD,
by William B. Bush. 2 Oct 59, 41p. incl. illus. tables (Rept. no. TR-59-0000-00668)
(Contract AF 04(647)309)
Unclassified report

DESCRIPTORS: (*Laminar boundary layer, Magnetic fields, *Magnetohydrodynamics, Fluid mechanics, Gas flow.) (Mathematical analysis, Differential equations.)

A modified Stewartson transformation is applied to the laminar compressible magneto-aerodynamic boundary layer equations and the requirement of similarity is introduced, resulting in a set of ordinary nonlinear differential equations. In addition to the now familiar fluid mechanical requirements for similarity of the system concerning density, viscosity, wall temperature, Prandtl number, and free stream velocity distribution, it is necessary to meet certain requirements as to the electrical conductivity distribution through the boundary layer and the intensity of the component of the magnetic field acting normal to the direction of flow. (Author)

AD-266 416 Div. 25, 9
(TIPTP/MFA) OTS price $7.60

Flight Sciences Lab., Inc., Buffalo, N. Y.
THEORETICAL RESEARCH ON THE STORAGE OF HIGH TEMPERATURE GASES,
by F. S. Roehrs. July 61, 72p. incl. illus. tables.
(Contract AF 33(616)6533, Proj. no. 7063)
(ARL 57) Unclassified report

DESCRIPTORS: (*Gases, *High temperature research, *Storage.) (Analysis, Heat transfer, Thermal conductivity, Boundary layer, Thermal radiation, Absorption, Cooling.) (Physical properties, Temperature, Density, Specific heat.) (Equations, Partial differential equations.)

Results of an analytic study of heat transfer problems associated with storage of high temperature gases are presented. It contains analytic discussions of the basic concepts of radiant heat transfer, conductive heat transfer, and chemical boundary layers. Analytic expressions for characteristic radiation lengths, characteristic radiative cooling rates, and characteristic conductive cooling times are developed and evaluated in a numerical study of hydrogen, helium, argon, and air. Numerical studies clearly demonstrate the fact that practical storage of high temperature gases will be limited to temperatures below the onset of the important bound-free radiation processes. In hydrogen this temperature limit is very low (2,600 Kelvin) due to the formation of the negative ion H(-). In the case of helium, the limiting temperature is unusually high (8,300 Kelvin) as a consequence of the high ionization potential. The influence of heterogeneous chemical reactions is limited to a thin chemical boundary layer which can be ignored in analytic studies of the temperature profiles. (Author)

AD-266 421 Div. 25, 15
(TIPTP/MFA) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
MEASUREMENT OF THE FORCES DUE TO THE INTERACTION OF A MOVING CONDUCTOR AND THE MAGNETIC FIELD OF THE ELECTRICAL CONDUCTIVITY METER,
by A. E. Fuhs and R. Betchov. 10 July 61, 17p. incl. illus. (Rept. no. TDR-594(1215-01)TR-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (Electrical conductance, Meters, Conductors, *Magnetic fields, Velocity.) (Instrumentation, Electrical connectors, Mercury, Differentiating circuits, Transformers, Aluminum.) (Numerical analysis, Experimental data, Equations.) (*Satellite attitude, Re-entry vehicles, Stabilization systems, Magnetohydrodynamics.)

A formula is derived relating the force on the magnet to electrical conductivity, velocity, and magnetic field. Experimental results show that the formula correctly predicts the dependence on velocity and applied magnetic field. The force calculated as a function of L, the distance between the meter and the moving conductor, exceeds the measured force. However, the changes in force with changes in L appear correctly accounted for by the formula. The force on the conductivity meter which was flown aboard RVX-2A Number 423 would have been 5.7 milligrams at peak electrical conductivity. (Author)

AD-266 426 Div. 25
(TIPTP/MFA) OTS price $1.10

Aerospace Corp., El Segundo, Calif.
THE GENERATION OF HIGH POWER RADIO FREQUENCY PULSES BY MEANS OF AN EXPLODING WIRE TECHNIQUE,

by Ieuan R. Jones and Ralph F. Wuerker.
20 Mar 61, 4p. incl. illus. (Rept. no. TDR-594(1208-01)TN-1)
(Contract AF 04(647)594; In cooperation with Space Technology Labs., Inc., Los Angeles, Calif.)
Unclassified report

DESCRIPTORS: (Plasma physics, *Wire, *Explosions, *Radiofrequency pulses, *Radiofrequency power, Tuned circuits, Wiring diagrams.) (Instrumentation, Capacitors, Coils, Design.)

A method is described for generating high power radio frequency pulses lasting only a few microseconds, which involves discharging a capacitor through a triggered spark gap in series with an exploding wire and a radiofrequency tank circuit. To illustrate the method, a particular experiment is presented. (Author)

AD-266 438 Div. 25
(TIPTP/MFA) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
LOW-TEMPERATURE KINETIC BEHAVIOR OF HYDROGEN ATOMS IN GAMMA-IRRADIATED ICE,
by John M. Flournoy, Lillian H. Baum, and Seymour Siegel. Nov 61, 25p. incl. illus. (Rept. no. TN-42)
(Contract AF 18(603)110, Proj. 9750)
(AFOSR-1541) Unclassified report

DESCRIPTORS: (Radioactivation analysis, *Gamma emission, Hydrogen, Atoms, *Ice, Liquefied gases, Helium, Energy, Stability, Temperature, Measurement, Chemical reactions, Half-life, Tritium.) (Instrumentation, Gamma ray spectrometers, Electric bridges.)

The rate of disappearance of trapped hydrogen atoms in gamma-irradiated ice has been studied at temperatures up to 60 K. H atoms produced by gamma-irradiation of ice at 4.2 K appear to be trapped in a variety of different sites, with activation energies for de-trapping ranging from less than 1.0 to more than 2.0 kcal/mole. The results are discussed in terms of various models; the preferred model involves an initially non-isotropic spatial distribution. (Author)

AD-266 440 Div. 25
(TIPTP/MFA) OTS price $2.60

Aerospace Corp., El Segundo, Calif.
ENERGY CONVERSION INCLUDING MAGNETOAERODYNAMIC STUDIES AND THERMIONIC CONVERTERS. THERMIONIC CONVERTER STUDIES.
Semiannual technical rept. 1 Jan-30 June 61, by R. C. Horn. 30 June 61, 23p. incl. illus. tables (Rept. no. TDR-594(1201-03)TR-1, pt. 2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Thermionic emission, Energy, Electron guns, Ionization, Measurement, Electrodes, *Plasma physics, Transport properties, Elastic scattering, Test equipment.) (Instrumentation, Design, Photomultipliers, Monochromatic light.) (Experimental data, *Spectrographic data, Cesium, Tables.) (Recombination reactions, Electron transitions.) Superaerodynamics.

A plane-parallel cesium thermionic converter was constructed, and is about to be put into operation. A second converter, which permits spectrographic determination of cesium species temperatures and densities, was designed. Analytical studies of plasma and sheath phenomena occurring in high pressure operation of a converter are in progress. Elastic scattering cross sections and momentum transfer cross sections for collisions of low energy were calculated and a report was issued. A literature survey of transition probabilities for transitions from the ground state in cesium was conducted and a tabulation of experimental values made. (Author)

AD-266 442 Div. 25
(TIPTM/BRW) OTS price $1.60

Aerospace Corp., El Segundo, Calif.
DAMPING OF SHAKER-EXCITED BEAMS CALCULATED SOLELY FROM DISPLACEMENT AMPLITUDE MEASUREMENTS,
by William P. Rodden and James S. Whittier.
Sep 61, 11p. incl. illus. (Rept. no. TDR-930 (2230-09)TN-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Beams, Cantilever beams, *Vibration mechanisms, Vibration, *Damping, Motion, Differential equations, Mathematical analysis.) Mechanics.

For some experimental setups involving a cantilever beam in steady-state vibration there exist simple relations between the tip-to-root displacement amplitude ratio and the damping of the beam. Derivations of these relations are presented along with a statement of conditions for their legitimate application. (Author)

AD-266 447 Div. 25, 15
(TIPTP/MFA) OTS price $2.60

Space Technology Labs., Inc., Los Angeles, Calif.
TORQUE ON A SPINNING METALLIC SPHERE INDUCED BY A TIME DEPENDENT MAGNETIC FIELD,
by Frank Tabakin. Sep 61, 25p. incl. illus.
(Rept. no. 6120-0027-RU-000)
(Contract AF 04(694)1)
(BSD TR 61-25) Unclassified report

DESCRIPTORS: (*Magnetic fields, *Spheres, Gyroscopes, *Metals, Bodies of revolution, Torque, Time, Magnetic moments, Conductivity, Dielectrics, Velocity, Rotating structures.) (Functions, Equations, Transformations (Mathematics).)

The problem of the interaction of radiation with spinning conductive matter is considered. The specific problem which is analyzed leads to the production of the misalignment of a simple gyroscope, a spinning metallic sphere, induced by a time dependent magnetic field. When a time dependent magnetic field is applied to a spinning sphere there is a torque on the sphere caused by the interaction of the incident magnetic field. The problem of calculating the torque on the sphere is treated. (Author)

AD-266 451 Div. 25, 17, 31
(TIPTM/BRW) OTS price $1.60

Committee on Ship Structure, National Research Council, Washington, D. C.
SIZE EFFECT IN BRITTLE FRACTURE OF NOTCHED STEEL

PLATES IN TENSION.
Progress rept. no. 1 on Proj. SR-158,
by J. H. Ludley and D. C. Drucker. 24 Nov 61,
9p. incl. illus. table (Serial no. SSC-135)
(Contract NObs-72046; In cooperation with
Brown U., Providence, Rhode Island, Contract
NObs-78440)
Unclassified report

DESCRIPTORS: (*Ship plates, Metal plates, Steel, *Fracture (Mechanics).) (Theory, Brittle materials, Configuration, Thickness, Test methods, Tests, Tensile properties, Stresses.)

Experimental evidence is presented to support the hypothesis that a Griffith-type theory (Phil. Trans. Roy. Soc. of London, 221:163, 1920) is not the critical condition for the initiation of brittle fracture in steel plates. The data indicate almost complete size independence for notched, compressively prestrained, Project E steel specimens of 6 2/3-, 10-, and 20-in. widths, which had geometrically similar dimensions in the plane of the plate but were of the same thickness. (Author)

AD-266 452 Div. 25, 14
(TIPTM/GEC) OTS price $5.60

Borden Co., Philadelphia, Pa.
STUDY LEADING TO THE DEVELOPMENT OF HIGH TEMPERATURE RESISTANT ADHESIVES.
Final rept. 22 June 60-21 June 61,
by J. Dickstein and B. D. Halpern. 21 June 61,
47p. incl. illus. tables.
(Contract DA 36-034-ORD-3316, Proj. TB4-002)
Unclassified report

DESCRIPTORS: (*Adhesives, *Metal-plastic adhesives, *Heat resistant polymers, Polymers, Phenols, Methyl radicals, Triazines, Thermosetting resins, Synthesis.) (Chemical reactions, Tensil properties, Physical properties, X-ray diffraction analysis, Gravimetric analysis.) (Adhesives for Stainless steel.)

An investigation was made of the synthesis of high temperature resistant metal adhesives. The following phenylene- and triazine-containing polymers were prepared: (1) polyphenylene, (2) polyxylenol from 2,6-xylenol, (3) polyxylenol from 4-bromo-2,6-xylenol, (4) polyaryl ethers from o-cresol novolacs, (5) melon, (6) condensation polymer of cyanuric chloride and benzoguanamine, (7) condensation polymer of 2-amino-4,6-diphenoxy triazine, and (8) condensation polymer of benzoguanamine and diphenyl carbonate (urea-linked triazine polymer). All the polymers showed good heat stability. The polyxylenols showed no weight loss up to 400 C. The polyxylenols showed excellent affinity for stainless steel. The higher molecular weight polyxylenols were difficult to mold. Modifications were made of the polyxylenols, but none of the derivatives approached the parent polymers in temperature resistance and metal adhesion. The combination of good metal-to-metal adhesion and temperature stability dictated that the ideal system should consist of a relatively low melting or liquid polymer capable of thermosetting under the conditions of cure. (Author)

AD-266 456 Div. 25, 8, 20
(TIPTP/GRW) OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
THEORETICAL AND EXPERIMENTAL STUDIES CONCERNING RADIATION DAMAGE IN SELECTED COMPOUND SEMICONDUCTORS.
Interim progress rept. no. 3, 15 Aug-15 Nov 61,
by L. W. Aukerman, E. M. Baroody and others.
15 Nov 61, 20p. incl. illus. table, 14 refs.
(Contract AF 33(616)8064)
Unclassified report

DESCRIPTORS: (*Radiation damage, *Semiconductors, Theory, Experimental data, *Fast neutrons.) (Heat treatment, Fast neutrons, *Neutron bombardment, Gallium compounds, *Arsenides, *Electron bombardment.) (Heat treatment, Fast neutrons, Indium compounds, *Phosphides, *Neutron bombardment.) (Gallium compounds, *Arsenides, Cadmium compounds, *Tellurides, *Sulfides, *Neutron bombardment, Optics, Absorption, Fast neutrons.)

Isothermal annealing experiments on neutron-irradiated n-type GaAs were analyzed in terms of two independent monomolecular processes. Since a similar behavior was observed in electron-irradiated GaAs, direct comparisons were made between the two types of damage. Isochronal annealing studies on neutron-irradiated n-type InP indicate that this material may have a more complex direct structure than does GaAs when irradiated at or near room temperature. Optical-transmission data obtained from neutron-irradiated GaAs, CdTe, and CdS are discussed in terms of a model in which the damaged sites consist of localized regions of a different phase. (Author)

AD-266 459 Div. 25, 14, 17
(TIPTM/GEC) OTS price $1.60

Cincinnati U., Ohio.
THERMODYNAMIC INVESTIGATION OF CERAMIC MATERIALS AT ELEVATED TEMPERATURES.
Quarterly rept., 15 June-15 Sep 61,
by Michael Hoch. 6 Nov 61, 9p. incl. tables,
10 refs.
(Contract AF 33(616)6299, Proj. 7021)
Unclassified report

DESCRIPTORS: (*Ceramic materials, *Refractory materials, *Thermodynamics, *High temperature research, Thermochemistry.) (Oxides of Iron compounds or Titanium compounds or Vanadium compounds or Niobium compounds.) (Chromium alloys, Nickel alloys.) (Zirconium compounds and Chromium compounds, Oxides.) (X-ray diffraction analysis, Mathematical prediction, Phase studies.)

Structures investigated were FeO, TiO, VO, and NbO (all NaCl structure). They belong in 2 groups: One group is FeO where only iron vacancies are present. The other group is TiO, VO, and NbO where both anion and cation vacancies can be found. In both groups the concentration of vacancies is quite large. First, mathematical expressions for the interaction energy between vacancies were derived. In the compounds investigated, the defects occurred only as vacancies exhibited by both components. The grand partition function for a crystal with only vacancies present is presented. (Author)

AD-266 465 Div. 25
(TIPTP/MFA) OTS price $8.60

Louvain U. (Belgium).
THERMOELASTIC STABILITY, STRESSES AND DEFLECTIONS OF THIN PLATES.
Technical note,
by F. Buckens. Aug 61, 99p. incl. illus. tables.
(Contract AF 61(052)499)
(AFOSR-1510) Unclassified report

DESCRIPTORS: (*Sheets, *Stresses, Deflection, Buckling, *Stability, Load distribution, Deformation, Thermal stresses, Amplitude modulation.) (Functions, Equations, Linear systems, Operators (Mathematics), Differential equations.) (Experimental data, Tables.)

An approximate solution of the problem of the stability of an homogeneous simply connected thin plate is given, for any thermal stress distributions assuming the edges to be unrestrained in the plane. Under special conditions this gives a lower bound for the critical level of temperature, when its increase is assumed to incur no change in its relative distribution. Comparison with exact solutions for circular plates gives excellent verifications. A reasonably simple method is also described to study post-buckling behavior when the temperature has increased beyond its critical level; it gives the changing pattern of stress distribution and, less directly, the changing shapes and amplitudes of deflection. The effect of initial deflections is studied and an approximate method developed, suggested by previously used properties of Airy functions at critical levels. Practical application is here far more cumbersome. The effect of restrictions at the edges are taken care of by applying an approximate formula which makes use of the critical levels of temperature determined without them. (Author)

AD-266 495 Div. 25, 15
(TIPTP/MFA) OTS price $4.60

California U., Los Angeles.
VORTEX SOUND,
by Alan Powell. Oct 61, 43p. incl. illus.
(Rept. no. 61-70)
(Contract Nonr-23362)
Unclassified report

DESCRIPTORS: (*Sound, *Vortices, Fluid flow, Aerodynamics, Acoustics.) (Compressible flow, Cylindrical bodies, Vibration, Motion, Wake, Measurement.) (Mathematical analysis, Differential equations, Transformations (Mathematics), Green's function, Perturbation theory.)

Physical arguments are developed to show how aerodynamic sound is generated as a result of the movement of vortices, or of vorticity, in an unsteady fluid flow. In a very simple model the aeolian tone is attributed to the dipole-like flow caused by the stretching of vortex rings. There is no net stretching of vortex rings in a free flow, but each moving element of vorticity still causes a local dipole-like flow, so that equal and opposite elements act together to form quadrupoles. Mathematical developments follow. The simple aeolian tone model is shown to be valid for low Strouhal numbers, the general result also incorporating the effect of the fluctuating Bernoulli pressure at the surface of the body. The free flow quadrupole model is shown to be exact, and also to agree with Lighthill's result. Using vorticity as a common basis, the compressible flow is compared to the corresponding incompressible one, the hydrodynamic field and the relationship to classical field theory being discussed. (Author)

AD-266 519 Div. 25
(TIPTP/MFA) OTS price $1.60

Geophysics Corp. of America, Bedford, Mass.
(A) CHARGED PARTICLES IN THE UPPER ATMOSPHERE.
(B) RECOMBINATION COEFFICIENTS,
by Alexander Dalgarno. Jan 61, rev. June 61, 115p. incl. illus. tables (GCA Technical rept. no. 60-4-G)
Unclassified report

DESCRIPTORS: (*Particles, Electrical conductance, *Upper atmosphere.) (Elastic scattering, Gas diffusion, Hall effect, Plasma physics, Transport properties, Differential cross sections, Excitation, Ionization, Thermionic emission.) (*Recombination reactions, Quantum mechanics.) (Differential cross sections, Electron capture, Photochemical reactions.) (Mathematical logic, Probability, Gas diffusion.)

AD-266 536 Div. 25, 15
(TIPTP/MFA) OTS price $1.60

Israel Inst. of Tech., Haifa.
FIELD OF A PARTICLE IN UNIFORM MOTION AND UNIFORM ACCELERATION,
by Nathan Rosen. 1 Sep 61, 11p. (Scientific note no. 1)
(Contract AF 61(052)02)
(ARL-183) Unclassified report

DESCRIPTORS: (*Relativity theory, *Particles, *Motion, Acceleration, Electromagnetic fields, Gravity, Electrostatics.) (Tensor analysis, Equations, Transformations (Mathematics).)

The line element in the neighborhood of a charged particle, according to general relativity theory, is put into the isotropic form. By means of a Lorentz transformation the gravitational and electromagnetic fields of a particle in uniform motion are obtained. By transforming to a uniformly accelerated system, one obtains the fields of a particle accelerated in a uniform gravitational field. From the form of the solution, it can be concluded that a charged particle in a uniform gravitational field does not radiate. (Author)

AD-266 537 Div. 25
(TIPTP/WH) OTS price $1.60

National Electrotechnical Inst. (Italy).
FURTHER EXPERIMENTS ON SURFACE CONDUCTIVITY OF METALLIC THIN FILMS,
by G. Bonfiglioli and R. Malvano. July 61, 13p. illus. tables (Technical note no. 5)
(Contract AF 61(052)328)
(AFOSR-1505) Unclassified report

DESCRIPTORS: (*Electrical conductance, Surface properties, *Metals, Hall effect.) (Aluminum, Bismuth, Copper, Gold, Nickel, Silver, *Thin films.) (Electric fields, Hall effect.) (Temperature, Dielectrics, Frequency modulation.) (Instrumentation, Electric bridges.) (Equations, Energy, Integration.)

The following points are considered: (1) improvement of the ac bridge used to measure the effect of conductivity modulation caused by transverse electric field (TEFE); (2) preliminary measurements of the TEFE on other metal films, than those already investigated, i.e.: Al, Ni, Cu, Ag; (3) repetition of the TEFE measurements in Au and Bi vs. temperature extending the temperature range as low as to liquid nitrogen temperature; (4) discussion of possible application of TEFE; and (5) discussion of a model advanced to interpret in a purely phenomenological way the TEFE in simple metals, as Au. (Author)

AD-266 549 Div. 25
(TIPTP/MFA) OTS price $5.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
RADIATION AND SCATTERING BY COLD, FINITE BEAMS,
by M. Scotto and P. Parzen. Oct 61, 51p. incl. illus. (Technical rept. no. AF-89)
(Contract AF 33(616)6753)
Unclassified report

DESCRIPTORS: (*Electron beams, Plasma physics, Scattering, *Electromagnetic waves, *Wave transmission.) (Cylindrical bodies, Sheets, Magnetic fields, Configuration, Polarization, Electric fields, Plasma oscillations, Resonance.) (Wave analysis, Equations of Motion.)

Two problems are treated which involve scattering by electron beams and plasmas. The first is concerned with the scattering of cylindrical and plane waves by a cylindrical plasma. Scattered amplitudes are computed for zero and infinite confining magnetic fields, and the effect of a finite field is estimated by comparing the results for the two extremes. The second problem involves scattering of plane waves by an electron sheet. Here, scattered amplitudes are computed for an infinitely thin sheet confined by a magnetic field of arbitrary magnitude. (Author)

AD-266 551 Div. 25
(TIPTP/WH) OTS price $7.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
HEAT CONDUCTIVITY OF POLYATOMIC AND POLAR GASES,
by E. A. Mason and L. Monchick. Aug 61, 74p. incl. illus. tables, 69 refs. (Rept. no. CM-1000)
(Contract NOrd-7386; In cooperation with Institute for Molecular Physics, University of Maryland)
Unclassified report

DESCRIPTORS: (*Molecules, Atoms, *Gases, *Thermal conductivity, *Kinetic theory.) (Quantum mechanics, Inelastic scattering, Transport properties.)

The formal kinetic theory of Wang Chang and Uhlenbeck (Univ. of Mich. Eng. Res. Rpt. no. CM-681, July 1951) and of Taxman (Phys. Rev. 110:1235, 1958) was used to derive explicit expressions for the heat conductivity of polyatomic and polar gases. By systematic inclusion of terms involving inelastic collisions the usual modified Eucken expression is derived as a first approximation, and as a second approximation an expression involving the relaxation times for various internal degrees of freedom (as well as the viscosity, diffusion coefficients, and heat capacity). For polar gases a second effect is often important since a resonant exchange of rotational energy is possible. The comparison of calculated and experimental results is generally satisfactory. (Author)

AD-266 553 Div. 25, 9
(TIPTP/MFA) OTS price $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
MAGNETOHYDRODYNAMICS AND ENERGY CONVERSION.
Technical progress rept. no. 4 for period ending 31 Aug 61.
15 Sep 61, 20p. incl. illus. tables.
(Contract AF 33(616)7624; In cooperation with National Science Foundation, Grant G-9330)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Plasma physics, Thermionic emission, Energy.) (Photomultipliers, *Generators, Coils, Electrical conductance, Inductance, Circuits.) (*Plasma oscillations, Thermionic emission, Cesium, Low pressure research, Frequency.) (*Thermal conductivity, *Thermal radiation, Heat transfer, Temperature, Rods.) (*Design, *Shock tubes, Magnetic pinch, Hydrogen, Magnetic fields.)

Contents:
Parametric generator
Experimental study of the oscillations in cesium thermionic converters
Temperature Distribution along a Strut that is losing Heat by conduction and radiation
Magnetically Driven T-Type Shock Tube of Rectangular Geometry

AD-266 560 Div. 25
(TIPTP/MFA) OTS price $1.10

Ecole Normale Superieure (France).
INELASTIC FORM FACTORS,
by M. Gourdin. 1961, 7p. (Technical note no. 27)
(Contract AF 61(052)173)
(AFOSR-1569)
Unclassified report

DESCRIPTORS: (*Inelastic scattering of *Electrons by Nucleons or Nuclei, *Photonuclear reactions, Electromagnetic effects, Particles, Differential cross section, Polarization.) (Functions, Equations, Energy, Integration.)

The inelastic scattering of electrons by nucleons or nuclei is treated. The process is related to the associated photonuclear reaction by using first order calculations of the electromagnetic coupling constant. (Author)

AD-266 567 Div. 25, 15
(TIPTP/MFA) OTS price $1.10

Michigan State U., East Lansing.
ON THE DETERMINATION OF THE MEAN FREE PATH OF CONDUCTION ELECTRONS,
by R. Kleinberg and F. J. Blatt. Nov 61, 5p.
(Contract AF 49(638)70)
(AFOSR-1612) Unclassified report

DESCRIPTORS: (*Conductivity, *Electrons, Magnetic properties, Transport properties, Resistance, Brillouin zones, Hall effect, Measurement.) (Equations, Motion, Energy.)

An earlier paper by Scheffers (Ann. der Physik 33, 29 (1956)) is critiqued. It presents Scheffers' result for the magnetoresistance ratio of a metal as being based on incorrect boundary conditions, and states that the agreement with experiment in the case of the noble metals is fortuitous. (Author)

AD-266 569 Div. 25
(TIPTP/MFA) OTS price $4.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
RELATIVISTIC BEAM-WAVE INTERACTIONS,
by Joseph E. Rowe. June 61, 38p. incl. illus.
(Rept. no. 03736-7-T; Technical rept. no. 48)
(Contract AF 30(602)2303)
(RADC TN 61-126) Unclassified report

DESCRIPTORS: (*Electron beams, Traveling wave tubes, *Electromagnetic waves, Wave transmission, *Relativity theory, Linear systems, Nonlinear systems, Analysis.) (Instrumentation, Microwave amplifiers, Klystrons, Circuits.) (Harmonic analysis, Motion, Equations, Transformations (Mathematics), Fourier analysis, Bessel functions.)

The results of the special theory of relativity were used to modify the nonlinear interaction equations for linear-beam devices to account for relativistic mass changes when the electron velocity is a significant fraction of the velocity of light. The effect of mass changes on gain and efficiency is evaluated and it is found that the gain is reduced and the efficiency increases rapidly as ke approaches one. The velocity spread in the stream is independent of the voltage. The harmonic current amplitudes and optimum drift distances are calculated for the relativistic klystron and one finds that as ke approaches one the klystron behaves according to a ballistic theory. (Author)

AD-266 600 Div. 25, 17
(TIPTP/JW) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE THEORY OF BENDING OF SANDWICH PLATES,
by Shun Cheng. Sep 61, 24p. incl. illus. (MRC Technical summary rept. no. 232)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Sandwich panels, Buckling, *Deformation, Vibration.) (Stresses, Differential equations.) (*Mechanics, Deflection, Deformation.) Mathematical analysis.

A system of differential equations for the small deflection of a sandwich plate is developed by means of a variational theorem. From these equations a governing differential equation for the deflection of a sandwich plate is derived. Solutions of this resultant equation, based on the present theory, may be readily obtained through the use of the techniques that were developed in the classical theory of plates. Three examples are presented. (Author)

AD-266 611 Div. 25
(TIPTM/TCG) OTS price $1.60

Oslo U. (Norway).
INVESTIGATION OF MOLECULAR STRUCTURES,
by O. Hassel. 14 Aug 61, 18p. incl. illus. tables (Technical (Scientific) note no. 4)
(Contract AF 61(052)71)
(AFOSR-1687) Unclassified report

DESCRIPTORS: (Crystal structure, *Molecular structure, Lattices of *Ethylenes, *Sulfides and *Iodides, *Methanes, Complex compounds by X-ray diffraction analysis, Electron diffraction analysis, Determination, Least squares method.) Atomic structure, Electron mass.

As part of a series of X-ray crystallographic investigations of addition compounds formed by different donor molecules and halides acting as electron acceptors, the crystal structure of a new compound dithiane-iodoform (1:1) has been determined. The crystals are monoclinic (space group P2 sub 1/m) with the lattice parameters: a = 6.56 Angstroms; b = 21.06 Angstroms; c = 4.47 Angstroms; and beta = 104.4 degrees. The structure contains infinite chains of alternating dithiane and CHI3 molecules, the former situated in centers of symmetry, the latter in mirror planes. The angle C-I-S is equal to 175 degrees. The I-S distance is 3.32 Angstroms and thus significantly shorter than the sum of the van der Waals radii of the S and the I atom. The I-S bonds are responsible for the formation of the chains just mentioned. (Author)

AD-266 618 Div. 25
(TIPTM/TCG) OTS price $11.50

Pennsylvania State U. Coll. of Mineral Industries, University Park.
CRYSTAL CHEMISTRY STUDIES.
Final rept. 1 Jan 60-30 Sep 61,
by Rustum Roy, R. Datta and others. 20 Oct 61, 157p. incl. illus. tables, 58 refs.
(Contract DA 36-039-sc-85311)
Unclassified report

DESCRIPTORS: (*Spinels, *Ferroelectric materials, *Piezoelectric crystals, *Ferroelectric crystals, *Ferromagnetic materials, Dielectric properties, Single crystals, Crystal structures, Crystals, Ions, Diffusion, Lattices, Temperature, X-ray diffraction analysis, Infrared spectroscopy, Phase studies.) (Quartz crystals, Garnet, Lithium compounds, Aluminum compounds, Gallium compounds, Silicon compounds, Magnesium compounds, Germanium compounds, Zinc compounds, Chromium compounds, Nickel compounds, Titanium compounds, Cobalt compounds, Oxides.) Solid state physics.

The study revealed that order-disorder of both the normal inverse type as well as possible 1:3 ordering on the octahedral sites is a common phenomenon in spinel structure phases. The existence of an equilibrium second-order phase transition in these phases was established. The usefulness of X-ray diffraction intensities, absorption spectra in the visible and IR, and lattice parameters to characterize the degree of disorder was demonstrated. Work on the synthesis of new ferrimagnetic materials is directed to the study of phases present and relative stabilities of successive Te oxides under controlled oxygen pressures. The building of simple crystal growth equipment was started.

AD-266 621 Div. 25, 9
(TIPTP/MFA) OTS price $4.60

Polytechnic Inst. of Brooklyn, N. Y.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF THE LAMINAR HEAT TRANSFER DOWNSTREAM OF A SHARP CORNER,
by Victor Zakkay and Takashi Tani. Oct 61, 39p. incl. illus. (PIBAL rept. no. 708)
(Contract AF 49(638)445, Proj. 9781)
(AFOSR-1640) Unclassified report

DESCRIPTORS: (*Heat transfer, *Laminar boundary layer, Supersonic flow around *Blunt bodies.) (Aerodynamics, Viscosity, Vortices, Pressure, Velocity, Shear stresses.) (Thermodynamics, Enthalpy.) (Experimental data, Analysis.)

An experimental and theoretical investigation of the laminar heat transfer downstream of a sharp convex corner is presented. The flow field in

the region of the discontinuity is divided into two parts: the flow field upstream of the discontinuity, obtained from standard viscous and inviscid techniques, and the flow immediately downstream of the sharp discontinuity, obtained by expanding both the supersonic and subsonic flow fields upstream of the discontinuity inviscidly around the corner. Downstream of the discontinuity the flow is represented by a viscous non-similar sublayer which starts at the discontinuity, and by a viscous shear layer at the outer edge which has the inviscid profiles immediately downstream of the discontinuity as initial conditions. The boundary conditions for the viscous sublayer at the outer edge are defined by the shear viscous layer. (Author)

AD-266 623 Div. 25
(TIPTM/BRW) OTS price $9.10

Polytechnic Inst. of Brooklyn, N. Y.
PRESSURIZED REINFORCED CIRCULAR CYLINDRICAL SHELLS - STRESSES IN ECCENTRIC NON-UNIFORM RINGS WITH TWO UNIFORM SECTIONS OF UNEQUAL LENGTH,
by Arnold Allentuch and Joseph Kempner. Oct 61, 94p. illus. (PIBAL Rept. no. 556)
(Contract Nonr-83914, Proj. NR 064-167)
Unclassified report

DESCRIPTORS: (Cylindrical bodies, Structural shells, *Stiffened cylinders, Rings, Structures, Hydrostatic pressure, Load distribution, Moments, Deformation, Deflection, Shear stresses, Stresses, Mathematical analysis, Differential equations.) Mechanics.

The numerical results of the solution of the interaction problem of a hydrostatically loaded, infinitely long circular cylindrical shell, reinforced by equally spaced stepwise discontinuous rings, with two uniform sections but different mean radii, indicate high bending stress concentration at the discontinuity. Within the range of the geometric parameters considered, a shifting of position of the discontinuity is accompanied by only minor changes in maximum bending stress. (Author)

AD-266 637 Div. 25
(TIPTM/EJH) OTS price $3.60

RIAS, Inc., Baltimore, Md.
THE REBINDER EFFECT AND THE ADSORPTION-LOCKING OF DISLOCATIONS IN LITHIUM FLUORIDE,
Quarterly status rept. no. 2, 27 June-30 Sep 61, by A. R. C. Westwood. 30 Sep 61, 44p. incl. illus. table, 21 refs.
(Contract DA 36-034-505-ORD-3349)
(WAL TR 832/1-3) Unclassified report

DESCRIPTORS: *Crystals, *Single crystals, Chemical milling, *Deformation, Lattices, Stresses, Hardening, Crystals, *Lithium compounds, *Fluorides, Surfaces, Adsorption, Molecules, Fatty acids, Stearic acids, Test methods, Microphotography, Theory.

Aqueous solutions of long chain fatty acids can serve as etchants for LiF. Such etchants made it possible to study effects of various environments on cross-gliding of screw dislocations at the surface of a crystal. Observations suggest that chemisorbed polar molecules restrict the motion of screw dislocations via adsorption-locking. An estimate of the strength of such locking is made and its existence confirmed by studies on the yielding behavior of LiF crystals. In contrast to Rebinder's (Proc. 2nd Intern. Cong. of Surf. Activity, 2:295, 1957) observations with metal crystals, adsorbed polar molecules cause an increase in yield and critical resolved shear-stresses before inducing the lower rate of work-hardening commonly known as the Rebinder-effect. (Author)

AD-266 648 Div. 25, 15
(TIPTP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ASYMPTOTIC PHENOMENON IN LARGE TORSION,
by B. R. Seth. Sep 61, 18p. incl. illus. (MRC Technical summary rept. no. 264)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Thermal conductivity, Electrical conductance, Deformation.) (Copper wire, Aluminum wire, Steel wire.) (*Stresses, Shear stresses, Physical properties, Elasticity.) (Non-linear differential equations, Differential equations, Partial differential equations, Cylindrical bodies.)

The asymptotic treatment of the finite torsion problem, studied here, provides one of the few examples in which a plastic state resulting from large deformation is predicted by the elastic theory. (Author)

AD-266 652 Div. 25
(TIPTP/MFA) OTS price $1.60

Research Information Service, New York.
ABSOLUTE OSCILLATOR STRENGTHS FOR LINES OF CHROMIUM, MANGANESE, AND COPPER,
by Yu. I. Ostrovskiy and N. P. Penkin. 23 Jan 57, 12p. incl. tables (Trans. nos. E 818 and T 1459 of Optika i Spektroskopiya 3:194-201, 1957)
Unclassified report

DESCRIPTORS: (*Photoemission, *Atomic spectrum, Resonance, Absorption.) (*Hyperfine structure, Chromium, Copper, Manganese.) (Spectrographic analysis, Experimental data, Tables.) (Translations, USSR.)

Rozhdestvenskiy's method was used in order to measure the absolute f for the resonance lines of Cr, Mn, and Cu. Measurements were also made of the relative f for other lines of these elements. These and earlier measurements are used in order to deduce the absolute f for 34 lines of Cr, 10 of Mn, and 3 of Cu. (Author)

AD-266 653 Div. 25
(TIPTP/MFA) OTS price $1.60

Research Information Service, New York.
RELATIVE VALUES OF OSCILLATOR STRENGTHS IN THE SPECTRA OF TITANIUM AND MANGANESE,
by U. I. Ostrovsky, G. F. Parchevsky, and N. P. Pyenkin. 1956, 17p. (Trans. nos. E 819 and T 1460 of Optics and Spectroscopy 1:821-832, 1956)
Unclassified report

DESCRIPTORS: (*Atomic spectrum, Titanium, Manganese, Oscillators.) (*Photoemission, Absorption, Excitation, High temperature research, Ovens, Vacuum furnaces.) (Laboratory equipment, Interferometers, Spectrographic data.)

Intensity measurements are carried out for the lines of titanium and manganese. A large interferometer apparatus designed to determine the f numbers in the spectra of elements which are refractory and difficult to vaporize was used. This apparatus which is described in detail consists of a source of continuous spectrum and an autocollimating spectrograph with a concave mirror and a flat diffraction grating. The column of titanium or manganese vapor was obtained in a high temperature vacuum furnace which was introduced into one beam of the interferometer. (Author)

AD-266 655 Div. 25
(TIPTP/MFA) OTS price $1.60

Research Information Service, New York.
CONTRIBUTION TO THE STUDY OF THE NATURE OF THE EMISSION CENTERS OF EXOELECTRONS,
by Paul Petrescu. 10 Feb 60, 14p. illus.
(Trans. no. E 821 and T 1063)
Unclassified report

DESCRIPTORS: (*Photoemission, *Electrons, Photoelectric effect.) (Atomic spectrum, Light, Polarization, Absorption, Aluminum, *Color centers.) (Instrumentation, Radiation counters.)

Some results which can be obtained by applying some criteria in the interpretation of certain experiments about the nature of the emission centers of exoelectrons are presented. (Author)

AD-266 656 Div. 25
(TIPTP/MFA) OTS price $1.10

Research Information Service, New York.
MECHANISM OF EXCITATION OF SPECTRAL LINES IN A HIGH-TEMPERATURE VACUUM OVEN,
by S. E. Frich, N. P. Penkin, and A. M. Shukhtin.
24 Jan 48, 5p. incl. table (Trans. nos. E-817 and T-1457 of Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki 18:734-736, 1948)
Unclassified report

DESCRIPTORS: (*Atomic spectrum, *Excitation, High temperature research, Ovens, *Vacuum furnaces.) (Ionization, Plasma physics, Thermal radiation, Absorption, Diffraction gratings, Barium, Strontium.) (Instrumentation, Experimental data, Tables.)

Line reversal was used to show that the atoms in a high-temperature vacuum oven have an equilibrium distribution over the excited levels. The temperature deduced from the distribution is the same as the measured temperature of the oven wall (within the errors of experiment). It is deduced that the excitation is purely thermal under these conditions. (Author)

AD-266 657 Div. 25
(TIPTP/MFA) OTS price $1.10

Research Information Service, New York.
THERMAL IONIZATION OF BARIUM VAPOR BY THE ROZHDESTVENSKI METHOD,
by N. P. Penkin. 1947, 5p. (Trans. nos. E-816 and T-1456 of Bull. (Izv) An SSSR, Phys. ser. 11:217-220, 1947)
Unclassified report

DESCRIPTORS: (*Heating, *Ionization, *Barium, Vapors, Metals, Temperature, Absorption, Spectrographic analysis.) (Spectrographic data, Tables.)

Rozhdestvenskiy's method employs the distance between the peaks on interference lines around an absorption line in order to determine the relative proportions of atoms and ions (apart from a constant factor, which is close to one). The wavelengths of the absorption lines for barium are presented. (Author)

AD-266 662 Div. 25, 8
(TIPTM/EJH) OTS price $5.60

Sylvania Electric Products, Inc., Woburn, Mass.
INVESTIGATION AND DEVELOPMENT IN THE AREA OF EPITAXIAL GROWTH TECHNIQUES.
Quarterly rept. no. 1, 1 June-31 Aug 61,
by P. Wang, R. Berkstresser and others.
31 Aug 61, 52p. incl. illus. tables.
(Contract NObsr-85431, Proj. SR-0080302)
Unclassified report

DESCRIPTORS: (*Diodes, *Semiconductors, Preparation, Manufacturing methods.) (*Films, *Thin films, Silicon, Crystals, Single crystals, Growth, Preparation, Thickness, Resistance.) (*Silicon, Chlorides, Silanes, Silicon compounds, Boron compounds, Phosphorus compounds, Arsenic compounds, Halides, Vapors, Deposits, Temperature, Chemical impurities.) Thermodynamics.

The effect of substrate temperature on deposition rate for SiCl4 and SiHCl3 systems was studied and activation energies determined. Layer resistivity control was demonstrated with four separate doping techniques. The most versatile technique appears to be vapor mixing though the mixed liquid technique is more accurate to date. Layer resistivities and thickness were measured. Successful oxide masking of the epitaxial layer growth was demonstrated. Samples of semi-epitaxial mesa diodes fabricated from n type layers grown on degenerate p type substrates were submitted. (Author)

AD-266 665 Div. 25
(TIPTP/JP) OTS price $2.60

Space Technology Lnbs., Inc., Los Angeles, Calif.
MATRIX FORMULATION OF PLANE MIRROR REFLECTION,
by Dale Vrabec. 1 Aug 61, 18p. incl. illus.
(Rept. no. 7103-0029-NU-000)
(Contract AF 04(647)619)
(BSD TN 61-10) Unclassified report

DESCRIPTORS: (*Mirrors, *Optical images, *Reflection, Mathematical analysis, Matrix algebra, Vector analysis.) (*Reflectors, Astrophysics, Mathematical analysis, Analytic geometry.)

The law of reflection by a plane mirror is formulated in terms of a matrix, representing the plane mirror, which operates on position and direction vectors in the object space of the mirror, transforming them to the corresponding vectors in the image space of the mirror. In this formulation, the reflection properties of a system of plane mirrors are readily analyzed by a systematic application of matrix algebra to the reflection matrices corresponding to the individual mirrors. For purpose of illustration, the method is applied to derive some simple reflection properties of the penta reflector, and to calculate the magnitude of alignment error resulting from misalignment of the penta reflector, when used in a representative alignment application. (Author)

AD-266 681 Div. 25
(TIPTP/WH) OTS price $2.60

Stanford U., Calif.
EFFECT OF Pi-K INTERACTION ON NUCLEON FORM FACTORS; THE PROCESSES Pi Pi YIELDS KK AND Pi Pi YIELDS Pi Pi,
by Mao-Chao Chen. Oct 61, 21p. incl. illus. table (Technical note no. 388-47)
(Contract AF 49(638)388, Proj. 9750-37500)
(AFOSR-1683)
Unclassified report

DESCRIPTORS: (Mesons, *Pions, *Scattering, Particles, *Nucleons, Nuclear spins, Quantum mechanics.) (Transport properties, Nucleons.)

An evaluation is made of the relative contributions of 2K and 2 pi intermediate states to the isovector part of the nucleon's electromagnetic form factor. Dispersion theory is used, and spin and unphysical branch cuts are neglected. It is assumed that the K meson and the nucleon, N, are coupled indirectly through the K-pi and pi-N couplings only. Approximate integrations are carried out for different limiting cases. With the exception of situations where there is not a well-defined trend, all cases show that the 2K-state contribution to the nucleon vector form factor is small. Maximum cross sections and resonance energies for the processes pi pi yields pi pi and pi pi yields KK are also evaluated. (Author)

AD-266 686 Div. 25, 30
(TIPTP/GRW) OTS price $3.60

University of Southern Calif. Engineering Center, Los Angeles.
MICROWAVE MEASUREMENTS OF PLASMA FLOW IN A SUPERSONIC WIND TUNNEL,
by Koichi Oshima. Sep 61, 35p. incl. illus. tables (Rept. no. USCEC 83-208)
(Contract AF 49(638)831, Proj. 9783)
(AFOSR-1556) Unclassified report

DESCRIPTORS: (*Plasma physics, Gas flow, Measurement, Microwaves, Supersonic wind tunnels.) (*Gas ionization, Hypersonic flow, Electrons, Density, Measurement, Interferometers, Microwave equipment, Supersonic wind tunnels, Induction heating, Power supplies, Radiofrequency power.) (Dielectrics, Particles.)

A 24 kilomegacycle microwave interferometer is used to measure the density and the collision frequency of electrons in a plasma flow in a small supersonic wind tunnel, heated by 13 megacycle radio-frequency power supply. By means of slabs and strips of known dielectric properties, the characteristics of microwave interaction with the tunnel filled with the dielectrics is examined, and it is confirmed that the measured phase shift agrees with the predicted one. Results are obtained for a stable plasma flow, and they show reasonable values. The unstable plasma flow, which usually occurs at high input power and at low pressures, cannot be measured. (Author)

AD-266 692 Div. 25, 22
(TIPTP/JDP) OTS price $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUMERICAL AND ASYMPTOTIC METHODS OF INTEGRATING THE BERNOULLI-EULER EQUATION,
by A. S. Elder. Aug 61, 22p. incl. illus. table. (Technical note no. 1422)
Unclassified report

DESCRIPTORS: (*Gun barrels, *Vibration, Numerical methods and procedures, Differential equations, Integration.)

At present, Mykelstad's method (BRL R-1070) is used to calculate the normal modes and natural frequencies of gun tubes and other beams of variable cross section. In this method, the actual beam is replaced by an equivalent discrete system of concentrated masses and massless springs. The use of a discrete system in place of a continuous system introduces a truncation error which is small in the lower modes, but which may amount to several per cent in the higher modes. It is believed that a higher-order method of numerical integration in which the step size may be varied at will should considerably reduce this error. (Author)

AD-266 707 Div. 25, 4
(TIPTM/EJH) OTS price $3.60

Plastics Lab., Princeton U., N. J.
RESISTIVITY STUDIES ON POLYMER SEMICONDUCTORS,
by Costas G. Gogos and Herbert A. Pohl. 1 Nov 61, 25p. illus. 17 refs. (Technical rept. no. 63B)
(Contracts DA 36-039-sc-89143 and DA 36-039-sc-78105, Proj. 3-99-15-105)
Unclassified report

DESCRIPTORS: (*Semiconductors, Organic compounds, *Plastics, *Polymers, Benzenes, Phenols, Electrical properties, Resistance, Molecular structure, Theory.) (Hydroxides, *Anthracenes, Quinones, Naphthyl radicals, Anhydrides, Polymerization.) (Chemical reactions, Synthesis.)

Eighteen polyacene polymers were synthesized and their resistivities were found to be of the order of 10 to the 4th power to 10 to the 5th power ohms-cm. Resistivity of these polymer semiconductors was found sensitive to changes in synthesis conditions, changes in the structure of the polymers, and variations of pressure and temperature during experimentation. The forbidden energy gaps for these polymers was about 0.5 ev. (Author)

AD-266 716 Div. 25, 17
(TIPTM/BRW) OTS price $1.25

New York U., N. Y.
INVESTIGATION OF CREEP BUCKLING OF COLUMNS AND PLATES. PART III: CREEP BUCKLING EXPERIMENTS WITH COLUMNS OF 2024-0 ALUMINUM ALLOY,
Rept. for Apr-Dec 60 on Materials Application, by Ralph Papirno and George Gerard. June 61, 37p. incl. illus. tables.
(Contract AF 33(616)5807, Proj. 7381)
(WADC TR 59-416, pt. 3)
Unclassified report

DESCRIPTORS: (*Beams, Metal plates, Creep, Buckling, Tests.) (*Aluminum alloys, *Creep, Mechanical properties, Heat treatment, Tests.) (Beams of Aluminum alloys, Deflection, Deformation, Stresses, Failure (Mechanics), Configuration, Test methods.) Theory, Tests, Mechanics.

Experimental data for short time and creep buckling of Al alloy 2024-0 columns at 500 F were collected. Two slenderness ratios, 40 and 60, were tested each with simulated pinned and fixed ends. Compressive short time and compressive creep data for the Al alloy were collected. A

technique, whereby end shortening and central deflection data are autographically recorded both during the period when the creep load was being applied and during creep, was used. It was possible to determine initial imperfections by the Southwell method for creep buckling. Data include initial imperfections as well as central deflection and end shortening data. Experimental relationships between applied stress and failure time are presented. (Author)

AD-266 720 Div. 25
(TIPTM/TCG) OTS price $.75

Minnesota U., Minneapolis.
EXPERIMENTS ON SLIP DAMPING AT ROUNDED CONTACTS.
Rept. for 15 June 60-31 Dec 61 on Metallic Materials,
by L. E. Goodman and C. B. Brown. June 61, 19p. incl. illus. table.
(Contract AF 33(616)6828, Proj. 7351)
(WADD TR 60-161, pt. 2)
Unclassified report

DESCRIPTORS: (Damping, *Spheres, *Stainless steel, Sliding contacts, Surfaces, Load distribution, Shear stresses, Elasticity, Friction, Hysteresis, Measurement, Theory.) (Laboratory equipment, Oscilloscopes.)

Modified apparatus was used to obtain measurements of energy dissipation per cycle at the contact between a flat plate and AISI 316 stainless steel spheres of various diameters. The dissipation occurred when the specimens were subject to various constant normal loads and tangential oscillating loads in the range 0.45 less than delta/delta (max) less than 1, where delta is the tangential displacement amplitude and delta (max) the amplitude just prior to gross slip. The results agree well with the theoretical predictions of Mindlin and Deresiewicz (J. Appl. Mechanics, 20, 1953). Neither the sphere diameter nor the normal load magnitude appear as essential parameters. The results indicate the necessity of using surface rather than bulk elastic constants in the determination of contact damping. (Author)

AD-266 723 Div. 25, 30
(TIPTM/EJH) OTS price $2.00

Massachusetts Inst. of Tech., Cambridge.
OPTICAL METHODS OF MEASURING PLASMA JET TEMPERATURES.
Rept. for June 59-Sep 60 on Experimental Techniques for Materials Research,
by H. C. Hottel, G. C. Williams, and W. P. Jensen. June 61, 71p. incl. illus. 178 refs.
(Contract AF 33(616)6570, Proj. 7364)
(WADD TR 60-676)
Unclassified report

DESCRIPTORS: (*Gases, *Plasma jets, *High temperature research, Photoemission, Intensity, Temperature, Measurement, Laboratory equipment, Instrumentation.) (Test methods, Thermodynamics, Spectrographic analysis, *Optical analysis, Microwaves, Attenuation, Gas ionization, Sound transmission.) (Test equipment, Photomultipliers, Optical filters, Oscilloscopes, *Pyrometers, Design, Electrical equipment, Thermocouples, Thermometers.) *Bibliography.

A literature study was made of methods for measuring temperatures of hot gases and plasmas, with emphasis on evaluation of non-spectroscopic techniques. For application to measurements on air stabilized plasma jets at temperatures to 8000 K and in the pressure range from 0.01 to 10 atmospheres, an optical technique was chosen, modified for fast response by use of a multiplier phototube as the receiver. The technique involves display on a cathode ray oscilloscope of signals alternately representing a single path and a double path (by means of a mirror) of the image of a portion of the plasma jet, the alternation being at 13. Extension of the range of possible temperature measurement to as high as 10,000 K is possible by interposition between the target and the pyrometer filament of neutral density glass filters, each having a transmissivity of about 4.5%. (Author)

AD-266 760 Div. 25, 14
(TIPTM/TCG) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CERTAIN PROBLEMS OF THERMAL STABILITY,
by M. Yu. Bal'shin and Tai Shou Huei. 3 Nov 61, 9p. incl. illus. (Trans. no. FTD-TT-61-160 of Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo 3:73-76, 1961)
Unclassified report

DESCRIPTORS: (*Solids, *Graphite with Plastics, Additives, Temperature, *Stability, Theory, Tests.) (Heat treatment, Sintering, Scheduling, Effectiveness on Conductivity, Stresses, Thermal stresses, Electrical properties, Resistance.) (Films, Surfaces, Crystal structure, Crystallization, Cavitation.) Translations, USSR.

The mechanism of the phenomena which arise in a solid as a result of cyclic heat treatment with rapid changes in temperature was studied. The conductivity of graphite with and without impregnated bakelite was measured to evaluate the thermal stability of the materials during heat treatment. It was confirmed experimentally that during cyclic heat treatment, the internal stresses associated with temperature variations caused a decrease in the contact surface. Compressive stresses associated with minute cavities in solids containing dispersed particles decreased electrical resistance and increased the contact surface. The thermal stability of a solid is determined by the properties, size, and shape of the material. Surface films can increase the thermal stability of a solid.

AD-266 764 Div. 25
(TIPTM/GEC) OTS price $1.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THE ELECTRIFICATION OF DROPS DURING ATOMIZATION OF LIQUIDS AS A RESULT OF FLUCTUATIONS IN THE ION DISTRIBUTION,
by G. L. Natanson. 27 Oct 61, 18p. incl. illus. tables, 10 refs. (Trans. no. MCL-1325 of Zhurnal Fizicheskoy Khimii 3:304-314, 1959)
Unclassified report

DESCRIPTORS: (*Ionization, Ions, *Atomization of Liquids, Conductivity, Direct current, *Drops of Vapors, Dissociation, Electrolytes.) (Technological intelligence, Translations, USSR.)

Division 25 - PHYSICS

A calculation of the magnitude of the fluctuation charges in liquids containing ions is given. The electrification of drops during atomization of liquids in the region of ion concentrations from 1 x 10 to the -11th power to 3 x 10 to the -9th power mole/liter for drops with radii from 0.5 to 2 microns is studied. The results agree with the fluctuation theory of the origin of the charges on atomized drops. A new method of non-electrochemical determination of the ion concentration (the ionic strength) in dielectric liquids is proposed. (Author)

AD-266 765 Div. 25
(TIPTA/VGW) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
A MAGNETOHYDRODYNAMIC GENERATOR WITH A ROCKET ENGINE.
27 Oct 61, 2p. (Trans. no. MCL-1334 of Przeglad Techniczny 45, 10p., 1960)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Generators, Gas ionization, Electric power production.) (Electric propulsion, Ion rockets.)

AD-266 769 Div. 25
(TIPTP/MFA) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
UTILIZING THE ENERGY OF THE IONOSPHERE (Vyuziti Energie Ionosfery).
Sep 61, 4p. incl. illus. (Trans. no. MCL-1292 of Kridla Vlasti 7:p. 11, 1960)
Unclassified report

DESCRIPTORS: (*Ionosphere, *Energy, Rocket motors, Ramjet engines, Recombination reactions, *Satellite vehicle research, Rocket propulsion, Gas ionization.) (Thermal radiation, Luminescence, Dissociation, Rocket fuels, Combustion.) (Translations, USSR.) Experimental data.

Soviet specialists have made rocket engine propulsion experiments at altitudes of perhaps 100 km to release 9 kg of nitric acid, which acted during the recombination of free oxygen atoms into molecules as a catalyst. The recombination led to the liberation of energy in form of visible light. Instantly after releasing the oxygen a luminous circle (ball) was formed which expanded gradually and within 10 minutes transformed into a large cloud more luminous than the Moon. The experiment clearly showed a considerable degree of dissociation in these altitudes; under the effect of a suitable catalyst there is large scale recombination and thus the liberation of a large amount of energy. (Author)

AD-266 775 Div. 25, 8
(TIPTP/TL) OTS price $5.60

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM.
Quarterly progress rept. no. 7, 16 June-15 Sep 61,
by R. Novick. 15 Sep 61, 52p. incl. illus. tables,
(Contract DA 36-039-sc-78330)
Unclassified report

DESCRIPTORS: (*Masers, *Radiometers, *Microwaves, *Microwave amplifiers, *Magnetrons, *Radio astronomy, Telescopes.) (Electromagnetic waves, Single crystals, Superconductors, Helium, Relaxation time, Nitrogen, Ionization, Radioactive isotopes, Cadmium, Quadrupole moments, Paramagnetic crystals, Tests, Solar corona.) (Ruby, Nuclear spins, Microwave frequency, Antennas, Optical systems, Molecular beams, Resonance absorption, Lattices, Nuclei, Electron bombardment, Phonons, Hyperfine structure.) (Particles, Detectors, Molecules, Surfaces, Conductivity, Low temperature research, High frequency.)

The 10 cm maser-radiometer is being used at the Naval Research Laboratory, initially for measurements on the planet Saturn. Experiments are described using an M-band radiotelescope at Columbia in an attempt to measure sextuply ionized nitrogen in the sun's corona. Developments in the production of a microwave cavity charged-particle-detector are discussed. A detailed discussion of several major maser projects is given, including recent work with optical masers. A number of projects dealing with microwave and atomic beam spectroscopy are described. Progress in studies of various atomic properties by means of high sensitivity optical double resonance methods is reported, including work on several isotopes of cadmium. An experiment to determine the lifetime of metastable helium ions is described in detail. (Author)

AD-266 777 Div. 25, 4
(TIPTM/TG) OTS price $7.60

Central Inst. for Industrial Research (Norway).
THE STRUCTURE OF LINEAR POLYMERS LOWER n-HYDROCARBONS.
Final technical rept. 1 Sep 60-31 Aug 61,
by Nico Norman and Hans Mathisen. Sep 61, 73p. incl. illus. tables, 29 refs. (SI Publ. no. 334)
(Contract DA 91-591-EUC-1553)
Unclassified report

DESCRIPTORS: (*Polymers, *Hydrocarbons, Organic compounds, *Crystal structure, Octanes, Hexanes, Heptanes, Pentanes, Methanes, Mixtures, Least square method, X-ray diffraction analysis.)

Final refinements of the crystal structures of n octane, n hexane, and n pentane were carried out. In the case of n pentane the space group proved to be Pbcn. Further refinements of the (yz)-projection of the n heptane structure were performed, including several cycles of least squares. This structure was also basically solved in the (xz)-projection and so the mode of packing was elucidated. In addition, a redetermination of the unit cell dimensions was performed, based on Debye-Scherrer diagrams. Finally it was shown that the space group is P1, and refinements on this basis were undertaken. The crystal system and the unit cell dimensions were determined for n nonane, n decane, n undecane, n dodecane, n tridecane, n tetradecane, and n hexadecane. The crystal data for these compounds are listed. From the study of mixtures of n C8H18 and n C10H22, and of n C8H18 and n C9H20, it is concluded that additions of other n paraffins have no influence on the crystal structure of the main component and that no solid solutions are formed. (Author)

AD-266 779 Div. 25, 17
(TIPTM/BRW) OTS price $1.60

Northwestern U., Evanston, Ill.
DETERMINATION OF TWIN FAULT PROBABILITIES FROM

THE DIFFRACTION PATTERNS OF F.C.C. METALS AND ALLOYS,
by J. B. Cohen and C. N. J. Wagner. 3 Nov 61, 10p. table (Technical rept. no. 1)
(Contract Nonr-122820, Proj. 031-680)
Unclassified report

DESCRIPTORS: (*Metallic crystals, Silver, Copper alloys, Aluminum alloys, *X-ray diffraction analysis, Powder metals, Powder alloys.) (Lattices, Deformation of Probability by Fourier analysis, Statistical analysis of X-ray spectrum, Data.) Metals, Alloys, Powders, Crystal structure.

A new technique is introduced for measuring twin fault probabilities in f.c.c. metals and alloys and is compared to 3 existing methods. The probability of finding a twin fault between neighboring (111) layers is related to the sine coefficients of a one-dimensional Fourier series representing the distribution of power per unit length of the powder reflection. The deformation stacking fault probability should be determined by measuring the change in position of the peak maximum and not the cg (which would include the effect of twin faults). This was indicated in the original theory and is shown more explicitly here. (Author)

AD-266 783 Div. 25
(TIPTP/MFA) OTS price $5.60

Kiel U. (Germany).
DEVELOPMENT OF METHODS FOR THE MEASUREMENT OF TEMPERATURES UP TO 10^5 °K.
Technical (Final) rept.,
by Woldemar Botticher, Hermann Christmann and others. 30 June 61, 50p. incl. illus. tables.
(Contract AF 61(052)368)
(ARL-146) Unclassified report

DESCRIPTORS: (Temperature, Measurement, *High temperature research, *Plasma physics, *Magnetic pinch, Electric arcs, Electrical conductance.) (Instrumentation, Discharge tubes, Helium, Oscilloscopes.) (Photographic analysis, Oscillograms, Experimental data, Tests.)

Three experiments were followed to obtain plasmas of 100,000 K. The first experiment attempted to pulse a confined electric arc with high current but did not lead to the desired high temperatures as the confinement breaks down. The second tried to use magnetic compression by an outer magnetic field (magnetic pinch) to compress and to heat the plasma simultaneously. Compression of the plasma of an arc burning at atmospheric pressure was not possible. A low pressure discharge was not sufficiently preionized. The use of a second condenser bank for preionization resulted in contraction and heating. The obtained temperatures were about 40,000 K. The third experiment was the linear pinch. Discharge in helium proved the existence of two outer zones of different temperatures. In the center of the discharge tube temperatures higher than 80,000 K were obtained. The pressure was about 15 atm and the radiation corresponded to thermal excitation. (Author)

AD-266 800 Div. 25, 8
(TIPTB/CCH) OTS price $5.60

Ordnance Tank-Automotive Command, Detroit, Mich.
A SOLID STATE ELECTROLUMINESCENT X-RAY INTENSIFIER,
by David K. Wilburn. 1 Mar 61, 48p. incl. illus. tables (Rept. no. RR-35)
(Proj. 5010.11.80600.51.01)
Unclassified report

DESCRIPTORS: (*Solid state physics, *X rays, *Amplifiers, Operation, Effectiveness.) (*Image intensifiers (Electronics), Luminescence, Intensity, Electronic systems, Iconoscopes.) Test equipment, Test facilities.

A new solid state high resolution x-ray panel amplifier is described, and evaluated under practical operating conditions. Data on contrast and detail sensitivity is presented and comparisons are made with conventional radiographic fluorescent screens. Intensifier output brightness is discussed as a function of x-ray excitation for energies up to 15 MEV. Typical panel amplifiers were viewed remotely with a high resolution low light level image orthicon system employing electronic storage techniques. For x-ray energies below 300 KVP, electroluminescent panels were viewed directly through 6-inches of lead glass. Kinescope photographs are presented to illustrate performance characteristics at higher x-ray energies. Procedures and techniques for remote viewing of fluorographic images are discussed, and recommendations made relative to achieving optimum performance. (Author)

AD-266 809 Div. 25
(TIPTP/MFA) OTS price $2.60

Columbia U., New York.
VIBRATIONS OF AN INFINITE, MONOCLINIC, CRYSTAL PLATE AT HIGH FREQUENCIES AND LONG WAVE LENGTHS.
Interim rept.,
by R. K. Kaul and R. D. Mindlin. July 61, 23p.
(Technical rept. no. 40; CU-53-61-onr-266(09)-CE, and CU-3-61-sc-87414)
(Contracts Nonr-26609, Proj. NR 064-388 and DA 36-039-sc-87414, DA Proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Vibration, *Crystals, Sheets, *High frequency, *Wave characteristics.) (Equations of Frequency, Motion, Deformation.)

An asymptotic solution of the frequency equation of an infinite, monoclinic, crystal plate is derived. Formulas are given which describe the variation of frequency with wave length at high frequencies and long wave lengths. (Author)

AD-266 810 Div. 25
(TIPTP/MFA) OTS price $2.60

Columbia U., New York.
FREQUENCY SPECTRUM OF A MONOCLINIC CRYSTAL PLATE.
Interim rept.,
by R. K. Kaul and R. D. Mindlin. July 61, 19p. illus. (Technical rept. no. 41; CU-54-61-onr-266(09)-CE, and CU-4-61-sc-87414)
(Contracts Nonr-26609, Proj. NR-064-388 and DA 36-039-sc-87414, DA proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Crystals, *Quartz, *Atomic spectrum.) (Equations, Frequency, Wave transmission, Elasticity, Motion, Complex variables.)

A sketch is constructed of the branches of Ekstein's frequency equation for an infinite, monoclinic crystal plate. The sketch is for the AT cut of quartz and covers a wide range of frequencies and propagation constants. The real, imaginary and complex segments of the branches are included. (Author)

AD-266 811 Div. 25
(TIPTP/MFA) OTS price $2.60

Columbia U., New York.
EXTENSIONAL VIBRATIONS OF THIN QUARTZ DISKS.
Interim rept.,
by A. G. Lubowe and R. D. Mindlin. July 61, 25p. illus. (Technical rept. no. 44; CU-57-61-onr-266(09)-CE and CU-7-61-sc-87414)
(Contracts Nonr-26609, Proj. NR 064-388 and DA 36-039-sc-87414, DA proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Vibrations in *Quartz, Sheets.) (Equations of Motion and Elasticity, Linear systems, Transformation (Mathematics), Integration.)

A general solution is given for the contour modes of vibration of circular, crystal disks of certain elastic symmetries. The solution is applicable to three cuts of quartz, for which the frequencies of fourteen modes are computed. (Author)

AD-266 812 Div. 25
(TIPTP/MFA) OTS price $2.60

Columbia U., New York.
FORCED VIBRATIONS OF PIEZOELECTRIC CRYSTAL PLATES.
Interim rept.,
by H. F. Tiersten and R. D. Mindlin. July 61, 24p. (Technical rept. no. 43, CU-56-61-onr-266(09)-CE, and CU-6-61-sc-87414)
(Contracts Nonr-26609, Proj. NR-064-388 and DA 36-039-sc-87414, DA proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Vibrations of *Piezoelectric crystals, Crystals, Sheets, Quartz.) (Equations of Motion and Electrostatics, Deformation, Differential equations.)

An extension is made of two-dimensional equations to include the piezoelectric relations and the electric field equations. The equations obtained are also extensions of previous equations in which the thickness-shear modes, the piezoelectric effect and the electric field equations were taken into account, but coupling with extensional modes was omitted. The new equations are deduced from the three-dimensional, linear, piezoelectric equations by a procedure based on the series expansion methods of Cauchy and Poisson and the variational method of Kirchhoff. (Author)

AD-266 813 Div. 25
(TIPTP/MFA) OTS price $1.60

Columbia U., New York.
STRESS FUNCTIONS FOR GENERALIZED PLANE STRESS IN ORTHOTROPIC PLATES.
Interim rept.,
by Y. T. Huang and R. D. Mindlin. July 61, 17p. (Technical rept. no. 45; CU-58-61-onr-266(09)-CE, and CU-8-61-sc-87414)
(Contracts Nonr-26609, Proj. NR-064-388 and DA 36-039-sc-87414, DA proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Stresses, Functions in *Crystals, *Sheets.) (Equations, Operators (Mathematics), Vector analysis, Harmonic analysis.)

A solution of the Cauchy-Voigt equilibrium equations of generalized plane stress, in orthotropic elastic plates, analogous to the Papkovitch solution for isotropic plates is presented. The displacements are expressed in terms of functions which are harmonic in transformed spaces. (Author)

AD-266 814 Div. 25
(TIPTP/MFA) OTS price $2.60

Columbia U., New York.
STRONG RESONANCES OF RECTANGULAR AT-CUT QUARTZ PLATES.
Interim rept.,
by R. D. Mindlin and D. C. Gazis. July 61, 15p. illus. table (Technical rept. no. 42; CU-55-61-onr-266(09)-CE, and CU-5-61-sc-87414)
(Contracts Nonr-26609, Proj. NR-064-388 and DA 36-039-sc-87414, DA Proj. 3A99-15-021)
Unclassified report

DESCRIPTORS: (*Crystals, Sheets, *Quartz, *Resonance, Piezoelectric effect, Deformation.) (Equations, Motion.)

Solutions of frequency equations are obtained and the results of computations of the resonant frequencies are compared with other frequency data. (Author)

AD-266 817 Div. 25, 14
(TIPTM/BRW) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
FERROMAGNETIC RESONANCE FROM 300 MC to 10 KMC IN ORIENTED YIG DISC,
by Dan Wortman, Leonard A. Ault, and Clyde A. Morrison. 8 Nov 61, 17p. incl. illus. (DOFL rept. no. TR-992)
(DOFL proj. 26300)
Unclassified report

DESCRIPTORS: (*Ferromagnetic materials, Single crystals, Disks, *Garnet, *Yttrium compounds, Iron compounds, Resonance absorption, Ferromagnetism.) Test equipment, Test methods.

Ferromagnetic resonance relations in single anisotropic YIG (yttrium iron garnet) crystals were investigated. The YIG samples were about 10 microns thick with a dielectric constant of 16. The peak of ferromagnetic resonance was at frequencies from 0.3 to 10 kMc. The frequency and resonance fields were measured simultaneously at various temperatures from -197 to 80 C. Correction to the H field, being about 0.03 oersted at 10 to the 10th power cps was considered small enough to be neglected in experimental work involving samples of such thickness. A correction to the line width over a wide frequency range is predicted; development of a more refined technique is necessary, however, to determine minute line-width variations. (Author)

AD-266 822 Div. 25,
(TIPTP/MFA) OTS price $1.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
AN ANALYSIS OF THE MASER OSCILLATOR EQUATIONS,
by Dennis M. Sinnett. Nov 61, 16p. incl. illus. (Rept. no. 2900-317-T)
(Contract DA 36-039-sc-78801, Proj. Michigan)
Unclassified report

DESCRIPTORS: (*Masers, Analysis, *Paramagnetic resonance, Oscillators, Equations, Damping.) (Numerical analysis, Computers, Equations.)

Maser oscillator equations which describe the interaction between the resonant cavity and the inverted population of the electron spin-system of the paramagnetic substance are presented. It is shown that these equations will not allow periodic solutions, thus refuting the theory, based on computer solutions, that this interaction is responsible for the pulsed mode of operation of the oscillator. Characteristics of solutions of these equations are determined analytically, and the ambiguity of computer solutions is discussed with the aid of examples. Numerical solutions are presented which show that periodic solutions may be induced by supplementing the spin-system equation with an additional term. (Author)

AD-266 847 Div. 25, 9
(TIPTP/WH) OTS price $14.00

Vitro Labs., West Orange, N. J.
ENERGY EXCHANGE IN THE HIGH-INTENSITY ARC PLASMA. Technical note no. 1 on Effect of Fluid Transpiration Through The Anodic Arc Boundary,
by C. Sheer, J. A. Cooney and others. 16 June 61, 206p. incl. illus. tables, 29 refs. (Rept. no. VL-2143-10-0)
(Contract AF 49(638)477, Proj. 9781)
(AFOSR-860) Unclassified report

DESCRIPTORS: (*Plasma physics, *Heat transfer to Liquids, Fluid flow.) (Anodes, Electrodes, Convection.)

Arc phenomena are discussed for the purposes of orientation and definition. Emphasis is placed on the distinction between low-intensity and high-intensity modes of arc operation. Following the preliminary discussion, the fundamental premises for the concept of a fluid transpiration arc are laid down. This concept relates to an arc discharge subject to the forced convection of a fluid medium, but differentiated from other systems of this type by the fact that the fluid is injected into the arc conduction zone via the anodic terminus through a porous anode structure. The postulated effectiveness criteria for this technique of arc heating require (1) that the average pore size be less than the anode fall space thickness, (2) that the transpiration surface be integrally congruent with the anodic discharge boundary, and (3) that the injected gas particle flux density have the same order of magnitude as the opposing drift electron flux density within the anode sheath region. A two-phase experimental program is described, the first being concerned with the validation of the basic concept and the second with a study of intrinsic characteristics. (Author)

AD-266 851 Div. 25, 17
(TIPTP/JW) OTS price $2.60

Watervliet Arsenal, N. Y.
A PRESSURE TECHNIQUE FOR DETERMINING RESIDUAL STRESSES IN CIRCULAR TUBES,
by R. E. Weigle, and J. P. Purtell. Sep 61, 32p. incl. illus. table (Technical rept. no. WVT RR 6110 R)
(DA Proj. 50101033) Unclassified report

DESCRIPTORS: (Measurement, *Stresses, Test methods.) (Pressure, *Cylindrical bodies, Gun barrels, Experimental data.) (Deformation, Strain gages, Measurement.) *Gun barrels.

An experimental method is described for direct measurement of pressure-induced residual stresses in tubes. Successive layers are removed from the tube bore. After each layer is removed, the tube is pressurized until the original exterior state of strain (monitored by strain gages) is restored. The required pressure is a direct measure of the original radial residual stress which existed at that point to which the tube material has been removed. Theory is developed for the residual stresses produced by inducing complete plasticity in a tube by means of internal pressure. Theoretical predictions of radial stress agreed well with measurements taken by the technique described. It is concluded that the technique is applicable to measurement of pressure-induced residual stresses in tubes and requires no previous knowledge of elastic constants. (Author)

AD-266 878 Div. 25, 8
(TIPTM/EJH) OTS price $7.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 8. SOLID STATE RESEARCH. Quarterly progress rept.
15 Nov 61, 63p. incl. illus. tables.
(Contract AF 19(604)7400)
(AFESD TN 61-1021) Unclassified report

DESCRIPTORS: (*Solid state physics, *Microwave equipment, *Electronic equipment, Transistors, Masers, Microwave amplifiers, Amplifiers, Diodes, Traveling wave tubes, Waveguides, Infrared detectors, Facsimile equipment, Facsimile receiver converters, Materials.) (*Semiconductors, Magnetic materials, Alloys, Intermetallic compounds, Metal films, Thin films, Films, Single crystals, Chemical impurities, Electrical properties, Resistance, Magnetic properties, Surface properties, Photoconductivity.)

Contents:
Solid state device design
Chemistry
Materials research
Band structure of solids
Microwave and Magnetic properties of solids
Magnetic materials
Magnetic films
Semiconductor components
Optics and IR

AD-266 897 Div. 25
(TIPTP/JDP) OTS price $4.60

Union Carbide Corp., Parma, Ohio.
HIGH TEMPERATURE THERMAL CONDUCTIVITY MEASUREMENTS PART II. THE RECTANGULAR BAR METHOD; EXPERIMENTAL TECHNIQUES,
by J. N. Pike and J. F. Doar. 1961, 43p. incl. illus. (Research rept. no. C-10)
(Contract DA 30-069-ORD-2787)
Unclassified report

DESCRIPTORS: (*Thermal conductivity, High temperature research, Measurement.) (Solids, *Heat transfer, *Electrical conductance, Test methods, Experimental data, Mathematical analysis, Applied mathematics.)

This analysis continues and extends the theoretical development of the rectangular bar method (RBM), describes the experimental techniques used, and shows how typical experimental data are reduced to numbers. (Author)

Division 25-PHYSICS

AD-266 899 Div. 25, 24
(TIPTP/TL) OTS price $12.00

Institute of Optics, U. of Rochester, N. Y.
ON SEVERAL PROBLEMS RELATING TO PHOTOGRAPHIC SPECTROPHOTOMETRY OF SHORT DURATION LIGHT PULSES.
Technical rept.,
by Gordon G. Milne and James A. Eyer.
30 June 61, 107p. illus.
(Contract DA 49-146-xz-008)
(DASA-1247) Unclassified report

DESCRIPTORS: (*Light pulses, Photography, Spectrometers, Spectrographic cameras, High speed cameras, Spectrographic analysis, High speed photography.) (Intensity, Instrumentation, Photographic recording systems, *Photographic emulsions, Time.) (Films, *Photographic film, Density, Measurement.) (Memory devices, Computers, Noise.)

Users of equipment for high-speed photography and time resolved spectroscopy often find that they must make density measurements on small areas of the film in order to maintain the nominal resolution of the instruments; similar problems arise when the photographic emulsion is used as a permanent memory unit in computers. If a fast emulsion is employed, the combined effects of emulsion granularity and a small densitometer aperture result in considerable grain noise on the densitometer trace; this noise in turn places stringent restrictions on the accuracy with which radiometric measurements can be made. A method for determining the detective speed, informational speed, and information capacity of emulsions in terms of their distinguishable density levels is described, and data on the performance of various emulsion-developer combinations is presented. (Author)

AD-266 904 Div. 25
(TIPTP/JW) OTS price $1.10

Microwave Lab., Stanford U., Calif.
ELECTRODYNAMIC PROBLEMS OF ASTROPHYSICS.
Technical status rept. no. 4, 1 July-30 Sep 61,
by P. A. Sturrock. Nov 61, 5p. incl. illus.
(ML Rept. no. 863)
(Contract AF 49(638)342, Proj. 9768)
Unclassified report

DESCRIPTORS: (*Plasma physics, Shock waves, Boundary layer.) (Magnetic fields, Fluid flow, Stars.) (Astrophysics, Magnetic fields.) (*Terrestrial magnetism, Particles, *Interstellar matter, Solar atmosphere, Magnetohydrodynamics, Plasma physics.)

AD-266 913 Div. 25, 14, 17
(TIPTP/WH) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
GENERALIZED STRAIN MEASURE WITH APPLICATIONS TO PHYSICAL PROBLEMS,
by B. R. Seth. July 61, 14p. (MRC Technical summary rept. no. 248)
(Contract DA 11-022-ORD-2059)
Unclassified report

IUTAM Symposium on Second Order Effects in Elasticity, Plasticity and Fluid Mechanics, Haifa, 1962.

DESCRIPTORS: (*Stresses, Mathematical analysis.) (Mathematical analysis, Tensor analysis, *Tensile properties, *Shear stresses.) (Materials, Deformation.) Elasticity.

AD-266 918 Div. 25, 9
(TIPTP/MFA) OTS price $3.60

AVCO Research Lab., Everett, Mass.
RADIATION FROM THE NON-EQUILIBRIUM SHOCK FRONT,
by J. D. Teare, S. Georgiev, and R. A. Allen.
Oct 61, 35p. incl. illus. table (Research rept. no. 112)
(Contract AF 19(604)7458)
(AFCRL-937) Unclassified report

DESCRIPTORS: (*Thermal radiation, *Shocks, *Re-entry aerodynamics, Laminar boundary layer, *Heat transfer, Hypersonic flow.) (Measurement and Experimental data, Tests, Shock waves, Vibrations, Dissociation, Temperature, Excitation.)

Radiative heating of hypersonic objects becomes a significant contributor to the over-all heat transfer at re-entry velocities in excess of 25,000 ft/sec. The radiation from the equilibrium gas cap behind the bow shock wave is in general the major contributor to this heating, but appreciable luminous front radiation is also associated with the non-equilibrium region immediately behind strong normal shock waves. A brief review is presented of the published information on radiative heating at 25,000 ft/sec. In addition, the problem of calculating the radiation from the non-equilibrium region at higher velocities is discussed, and some recent experimental measurements for two molecular band systems are presented. Finally, the expected intensity level of non-equilibrium radiation at 35,000 ft/sec is compared with the stagnation point heating caused by radiation from the equilibrium gas and by laminar aerodynamic heat transfer. (Author)

AD-266 931 Div. 25
(TIPTP/MFA) OTS price $4.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
COUPLING EFFECTS IN A TRANSIENT THERMOELASTIC PROBLEM,
by R. Muki and S. Breuer. Sep 61, 41p. incl. illus. (Technical rept. no. 14)
(Contract Nonr-56225, Proj. NR-064-431; In cooperation with Keio U.)
Unclassified report

DESCRIPTORS: (*Thermal conductivity, *Elasticity, Thermal diffusion, *Thermal expansion, Specific heat, Temperature, Thermal stresses, Attenuation, Shear stresses.) (Equations, Motion, Integrals, Integration.)

The coupled thermoelastic problem for a semi-infinite medium, the plane boundary of which is subjected to an instantaneous uniform change of temperature is considered. The body, which is supposed to be initially undisturbed, is assumed to be free from loading. The validity of the conventional quasi-static treatment of transient problems in thermoelasticity theory as a consequence of the coupling effect is treated. By means of the Laplace transform an exact solution in real integral form is obtained. The elastic wave with a sharp front, which accompanies the diffusion of the ensuing thermal stresses, is also encountered in the present circumstances. While the velocity of the wave front remains unaltered, the corresponding stress discontinuities are found to be attenuated once thermoelastic coupling is taken into account. (Author)

AD-266 951 Div. 25, 5
(TIPTP/MFA) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A THRESHOLD THEORY FOR PHASE-LOCKED LOOPS,
by H. L. Van Trees. 22 Aug 61, 26p. incl. illus. (Technical rept. no. 246)
(Contract NAS9-105)
Unclassified report

DESCRIPTORS: (*Circular coils, *Phase distortion, Communication systems, *Tonal thresholds.) (Frequency, Nonlinear systems, Feedback, Signal noise ratio.) (Instrumentation, Design.) (Equations, Functions, Taylor's series, Statistical processes.)

A model of a phase-locked loop has been developed which is valid for all signal-to-noise ratios. The model is in the form of a nonlinear feedback system with randomly time-varying parameters. The analysis considers two operating regions. In low signal-to-noise ratio regions, the important consideration is stability. We want to study the asymptotic stability in the mean of a nonlinear system. It follows directly that a necessary condition for asymptotic stability of any nonlinear system is that a linearized model about some equilibrium point be asymptotically stable. By considering all possible equilibrium points, we can find an upper bound on the value of noise density which makes the system unstable. This upper bound represents a threshold value for system operation. In high signal-to-noise ratio regions, our results provide an exact statistical description of system behavior. Therefore, knowledge of the spectrum of the signal and noise may be used to optimize the system configuration. (Author)

AD-266 958 Div. 25, 30
(TIPTP/MFA) OTS price $1.10

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
HIGH SPEED COMPUTER SYSTEM RESEARCH.
Quarterly progress rept. no. 4, 1 July-30 Sep 61, on Computer Components and Systems,
by E. W. Fletcher and A. L. Loeb. 31 Oct 61, 6p. incl. illus. tables.
(Contract NObsr-77603)
Unclassified report

DESCRIPTORS: (Solid state physics, *Thin films, Ferromagnetic materials, Dielectric, Magnetic effects, Optics, Perturbation theory, Intermetallic compounds.) (Crystal structure, Tin compounds, Copper compounds, Iron compounds, Algebra.) *Digital computers.

Contents:
Fundamental physics of the thin-film state
Magneto-optic effects in ferromagnetic thin films, by C. C. Robinson
The transverse kerr magneto-optic effect in thin magnetic films, by R. Callarotti
Measurement of the kerr effect in thin nickel-iron films, by S. B. Russell
Crystal algebra, by A. L. Loeb

AD-266 993 Div. 25
(TIPTP/JW) OTS price $9.60

University of Southern Calif., Engineering Center, Los Angeles.
ELECTROMAGNETIC RADIATION FROM A DIPOLE IN AN ANISOTROPIC PLASMA.
Technical note,
by Hans H. Kuehl. Sep 61, 13p. incl. illus.
(USCEC Rept. no. 79-203)
(Contract AF 49(638)522, Proj. 9768)
(AFOSR-1582) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, *Propagation, Plasma physics, Diffraction, Dipole antennas.) (Differential equations, Green's function.)

The general solution to the problem of the radiation of an electric dipole in a magnetically-biased cold plasma is presented. Several waves exist which travel in different directions with different indices of refraction. These waves interfere to produce beats and amplitude modulation and cause the resultant time-average energy flow to have components in other than the radial direction, contrary to the isotropic case. The propagation direction for the waves was determined. For the lossless case considered, the field was unbounded in certain directions for certain values of the plasma frequency and gyrofrequency. An equation is given for the directions of these singularities. The time-average Poynting vector and the group velocity for an individual wave are shown to be purely radial although the resultant Poynting vector due to all waves in the far zone has other components. Various limiting cases are amenable to solution. The case of a high operating frequency is treated; it is shown that the radiation pattern is approximately identical to the isotropic case. (Author)

AD-267 013 Div. 25, 8
(TIPTP/JDP) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
HARMONIC GENERATION IN FERROMAGNETIC ELLIPSOIDS OF REVOLUTION,
by Glenn E. Bennett. July 61, 34p. incl. illus.
(Rept. no. AFCRL 565)
(Proj. no. 5633)
Unclassified report

DESCRIPTORS: (*Ellipsoids, Bodies of revolution, Ferromagnetic materials, *Harmonic analysis.) (Ellipsoids, *Magnetic fields, Harmonic analysis.) (Ellipsoids, *Ferromagnetism, Resonance, L band, S band, X band, Harmonic analysis.) (*Ferromagnetic materials, S band, Disks, Garnet, Yttrium compounds, Iron alloys, *Frequency multipliers.)

Aspects of the magnetostatics of small ferromagnetic ellipsoids immersed in arbitrarily directed uniform magnetic fields are reviewed. Ferromagnetic resonance under these conditions is discussed, and theoretical information on the orientation of ellipsoids of revolution in these uniform fields necessary to produce resonance at L, S, and X band frequencies, in samples with saturation magnetizations of 1000, 1700, and 3000 gauss with the internal field arbitrarily directed, is graphically presented. Harmonic generation processes existing in these general geometries are analyzed. Harmonic components of the magnetization vector are found to occur both parallel and perpendicular to the internal magnetic field. Frequency doubling experiments, performed at S band on a thin polycrystalline disk of yttrium-iron garnet, supported these predictions and are reported. (Author)

AD-267 017 Div. 25, 9, 12
(TIPTP/MFA) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
THE KINETICS OF AIR IN A HYPERSONIC SHOCK WAVE,

by Sami Atallah. Aug 61, 32p. incl. tables (Rept. no. AFCRL 761)
(Proj. no. 5561)
Unclassified report

DESCRIPTORS: (*Shock waves, *Hypersonics, Air, Satellite vehicle research, Ionization, Plasma physics, *Reaction kinetics, Recombination reactions.) (Physical properties, Chemical properties, Temperature, Density, Energy.) (Equations, Experimental data, Tables.)

A survey of the kinetics of air in a hypersonic shock wave with temperatures ranging between 2000° and 6000°K and density ratios ρ/ρ_0 ranging between 10^{-4} and $10^{-5/2}$ was made. Best values of the rate constants were found for the following nonionic reactions:

$$O_2 + M \rightleftharpoons O + O + M$$
$$N_2 + M \rightleftharpoons N + N + M$$
$$NO + M \rightleftharpoons N + O + M$$
$$N_2 + O \rightleftharpoons NO + N$$

The rate constants for the ionic reaction

$$N + O \rightleftharpoons NO^+ + e^-$$

which was found to be the predominant ion- and electron-producing reaction were also reported. (Author)

AD-267 027 Div. 25
(TIPTP/MFA) OTS price $1.60

Microwave Lab., Stanford U., Calif.
PARAMETRIC EFFECTS IN A TWO-LEVEL ELECTRIC DIPOLE SYSTEM.
Technical rept.,
by J. Fontana, R. H. Pantell, and R. Smith.
Oct 61, 11p. (ML Rept. no. 849)
(Contract Nonr-22548, Proj. NR 373-361)
Unclassified report

DESCRIPTORS: (*Electric dipole transitions, Quantum mechanics, *Paramagnetic resonance, Electromagnetic waves, Magnetic fields, Electric fields, Direct current.) (Harmonic analysis, Perturbation theory, Differential equations, Matrix algebra.) *Parametric amplifiers.

In a two-level system with induced electrical dipole properties the relationship between an externally applied electric field and the expectation value of the dipole moment is expressed by a differential equation in which one coefficient is proportional to the instantaneous system energy. The nonlinear properties arising from this relationship allow parametric amplification of signals by pumping at another frequency, in the presence of a material containing active systems of this type. No population inversion is necessary. For optimum operation, both the pump and the signal should be within a few per cent of the natural frequency of the system. The electromagnetic Q required for parametric oscillations in a device of this sort is inversely proportional to the on-frequency absorption coefficient for the material. A numerical example shows that, at 1 millimeter wavelength, parametric oscillations will occur with a Q of 12,000 and a pump field of 10 kilovolts per centimeter in the gas. (Author)

AD-267 028 Div. 25, 30
(TIPTP/MFA) OTS price $8.60

Energy Conversion and Semiconductor Lab., Mass. Inst. of Tech., Cambridge.
RESEARCH ON MATERIALS, PROCESSES, AND DEVICES RELATED TO ENERGY CONVERSION.
30 Sep 61, 95p. incl. illus. tables (Semiannual technical summary rept. no. 1)
(Contract Nonr-184178)
(ARPA Order no. 214-61)
Unclassified report

DESCRIPTORS: (*Energy, Engineering, Materials, Processing, Instrumentation; Detectors.) (*Metallurgy, High temperature research.) (*Thermionic emission, Energy.) (*Superconductivity, Magnets.) *Fuel cells.

Research concerned:
Thermal-electric materials, processes, and devices including: Graded-Gap Detector using the HgTeCdTe system, Four-Probe Correction Factors for Wedge-Shaped Geometries, and Thermal-Photo-Voltaic Energy Converter using Germanium; Refractory thermoelectric materials of the Gd-Se- and Ce-Se systems and high temperature thermionic materials of the systems Y + Hf, Nb, Cr, Re, and Rh; and Mo plus ThO2, IaO2, BaO; Thermionic energy converter studies of emitter materials; Superconducting Materials of Niobium-Tin Alloys; Superconducting Solenoids using Niobium-Tin Materials; Fuel Cell Studies.

AD-267 035 Div. 25
(TIPTP/JDP) OTS price $2.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
SOME SOLUTIONS OF THE BOLTZMANN EQUATION,
by M. J. Offerhaus. 6 Nov 61, 21p. incl. illus.
(Rept. no. WIS-OOR-31)
(Contract DA 11-022-ORD-2526, Proj. TB2-0001)
Unclassified report

DESCRIPTORS: (Gases, *Reaction kinetics, *Quantum mechanics, Differential equations, Integral equations, Operators (Mathematics).) (Gases, *Hydrodynamics, Quantum mechanics.) (Gases, *Transport properties, Relaxation time.)

One-particle velocity distribution functions for a dilute gas, are found by solving the Boltzmann equation as an initial value problem. The departure of the distribution from the corresponding normal solution is developed in a series, each term being subject to relaxational decay. The pace of this process, called the kinetic stage, is set by the inverses of the lowest positive eigenvalues of the linearised collision operator O, which serve as relaxation times. During the hydrodynamical stage which follows, the inverse eigenvalues of O act as coefficients in the distribution function. The transition from the kinetic to the hydrodynamical stage is marked by the establishment of equilibrium between the effects of streaming and of collisions on the transport currents. During the hydrodynamical development, these currents retain stationary values proportional to the existing gradients of mean velocity and temperature. (Author)

AD-267 039 Div. 25, 15
(TIPTP/MFA) OTS price $2.75

Electronic Research Lab., U. of Calif., Berkeley.
EFFECTS OF THERMAL VELOCITIES IN MAGNETICALLY

FOCUSED ELECTRON BEAMS.
Rept. on Research on Physical Phenomena Affecting the Characteristics of Electronic Components, by J. L. Palmer. July 61, 137p. incl. illus.
(Contract AF 33(616)6139, Proj. 4150)
(ASD TR 61-125) Unclassified report

DESCRIPTORS: (*Electron beams, *Magnetic fields, *Thermionic emission, Velocity, Brillouin zones, Electric fields, Electron guns.) (Experimental data, Mathematical analysis, Ballistics, Optics, Laminar boundary layer.) (Particles, Measurement, Electric currents, Density, Oscillation.) (Equations, Motion, Perturbation theory.)

Three different models for representing an axially symmetric, magnetically focused electron beam, the laminar model, the optical model and the ballistic model, are analyzed mathematically and the computed behavior of each is compared with experimental observations of real electron beams. The over-all behavior of the laminar model agrees to some extent with the behavior of real electron beams; however, the motion of individual electrons or groups of electrons is not at all well predicted by the laminar model. The optical model describes with good accuracy the motion of individual electrons or groups of electrons, as well as the over-all behavior of real beams. The spreading of a beam by thermal velocities and the appearance of images in the current density at periodic intervals along a beam, phenomena that are observed experimentally, are predicted accurately by the optical model. Simple forms of lens aberrations are also treated with the aid of the optical model. (Author)

AD-267 040 Div. 25
(TIPTM/REB) OTS price $1.75

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
THERMO-ELASTIC EQUATIONS FOR A SANDWICH PANEL UNDER ARBITRARY TEMPERATURE DISTRIBUTION, TRANSVERSE LOAD AND EDGE COMPRESSION.
Rept. for Dec 60-Aug 61 on Metallic Materials, by Ibrahim K. Ebcioglu. Aug 61, 64p. incl. illus.
(Proj. 7351)
(ASD TR 61-128) Unclassified report

DESCRIPTORS: *Sandwich panels, Temperature, Mechanical properties, Elasticity, Theory, Differential equations, Stresses, Load distribution, Mathematical analysis.

The problem of designing sandwich panels for use under an arbitrary temperature distribution, transverse load, and edge compression was extremely simplified. The core of the sandwich panel is assumed to be orthotropic and the faces may be of different thicknesses and materials. The general differential equations for a sandwich panel are obtained from the principles of mechanics, and corresponding boundary conditions are formulated from the principle of virtual displacements and variational calculus. A reduction from 5 differential equations for a sandwich panel to 2 independent systems of differential equations is accomplished by the suitable transformations of the independent variables. The final 2 systems of differential equations are solved simultaneously for an arbitrary temperature distribution, transverse load, and uniform edge compression with simply-supported boundary conditions. The analysis is greatly simplified by the use of the superposition principle. The theoretical solution is applied to a particular temperature distribution and center deflection in the sandwich panel plotted against loading parameter. (Author)

AD-267 074 Div. 25, 17, 4
(TIPTM/BRW) OTS price $5.60

Central Inst. for Industrial Research (Norway).
OXIDATION OF TANTALUM IN THE TEMPERATURE RANGE 500-700 DEGREES C.
Technical (scientific) note no. 4, 1 Apr 60-31 Mar 61,
by Per Kofstad. Apr 61, 34p. illus. 38 refs.
(SI Pub. no. 317)
(Contract AF 61(052)90)
(ARL-84) Unclassified report

DESCRIPTORS: (*Tantalum, *Oxidation, Reaction kinetics, High temperature research, Low pressure research.) (*Tantalum compounds, Oxides, Nucleation, Growth, Oxygen, Chemical reactions, Adsorption, Lattices, Deformation, Microstructure, X-ray diffractionanalysis, Electron diffraction analysis, Electron microscopy, Metallurgical analysis, Grains (Metallurgy).)

The oxidation behaviour of Ta was studied in the temperature range 500 to 700 C and at 0 pressures ranging from 760 to 0.1 torr. The work comprises oxidation rate measurements and structural investigations of oxidized specimens by means of X-ray diffraction, electron diffraction, electron microscopy and metallographic techniques. During initial stages oxidation of Ta constitutes oxygen dissolution in the metal and the formation of one or two suboxides, termed Ta4O and TaO2, where TaO2 probably is the end structure of an intermediate precipitation phase resulting from an ordering of dissolved oxygen along dislocations and low-angle grain boundaries. During later stages a transition to a breakaway oxidation which eventually follows a linear rate is observed. The latter oxidation stage is accompanied by heavy Ta2O5-formation. The linear oxidation is interpreted in terms of an oxygen chemisorption equilibrium followed by a rate-determining reaction governed by nucleation and growth of Ta2O5-nuclei. (Author)

AD-267 085 Div. 25, 15
(TIPTP/TL) OTS price $4.60

General Dynamics/Fort Worth, Tex.
A MONTE CARLO PROCEDURE FOR CALCULATING PENETRATION OF NEUTRONS THROUGH STRAIGHT CYLINDRICAL DUCTS,
by D. G. Collins. 24 Nov 61, 49p. incl. illus. tables (Doc. no. NARF-61-33T; MR-N-286)
(Contract AF 33(657)7201)
Unclassified report

DESCRIPTORS: (*Cylindrical bodies, *Ducts, *Neutrons, Neutron beams, Attenuation, *Numerical methods and procedures, *Computers, Penetration, Scattering.) (Energy, Intensity, Sampling, Neutron detector.) (Iron, Containers, Water.) (Van De Graaff Generators, Nuclei, Elastic scattering, Inelastic scattering.) (Mathematical analysis, *Integral equations, Probability, Theory, Statistical functions.)

The Monte Carlo method is applied to evaluate the energy and angular distributions and the intensity of the scattered neutron flux that penetrates a straight cylindrical duct. A discussion of the scattering theory involved is given, as well as the sampling techniques peculiar to the duct-penetration problem. The method is evaluated on the basis of comparisons with experimental data. (Author)

AD-267 097 Div. 25
(TIPTP/TL) OTS price $3.60

Microwave Physics Lab., Palo Alto, Calif.
ENERGY TRANSFER IN PLASMAS.
Mid-term progress rept., 2 Feb-25 Aug 61.
21 Sep 61, 33p. incl. illus.
(Contract AF 30(602)-2452, Proj. 5561)
(RADC TN 61-222)

Unclassified report

DESCRIPTORS: (*Plasma physics, *Microwaves, *Paramagnetic resonance, Nuclear magnetic resonance, Electromagnetic waves, Energy, Absorption, Helium, Electric discharge.) (Shock tubes, Light, Velocity, Gases, Pressure, Electrons, Density, Shock waves, Diffusion.)

The effect of metastable atoms on the absorption of microwave energy is to be studied. This process is not only important in the simple gases such as helium but even more so in the more complicated gases such as oxygen and nitrogen. It is important to study the simplest atomic and/or molecular structure in order that new methods of measurement may be perfected. Thus the program is designed to perfect diagnostic tools by a study of metastable production in a helium discharge. A program of shock tube improvement was initiated to provide a shock wave from which extraneous effects are removed. In this way more definitive correlation between theory and experiment may be attained. (Author)

26. PRODUCTION AND MANAGEMENT

AD-266 171 Div. 26, 17, 14
(TIPTM/BRW) OTS price $4.60

Southern Research Inst., Birmingham, Ala.
INVESTIGATION OF THE FEASIBILITY OF WELDING MOLYBDENUM SHEET WITH A DEOXIDIZING AND GRAIN-REFINING FLUX.
Final rept. 30 Dec 60-30 Sep 61,
by A. Clyde Willhelm. 3 Nov 61, 36p. incl. illus. table.
(Contract NOw 61-0366-d)
Unclassified report

DESCRIPTORS: (*Welding fluxes, Arc welding, *Arc welds, Deoxidation, Nucleation, Grains (Metallurgy), Viscosity, Adhesion, Conductivity, Electrical conductance.) (Sheets, Molybdenum, *Molybdenum alloys, Titanium alloys, Zirconium alloys.) (Binders, Carbon black, Powders, Ceramic materials, Aluminum compounds, Silicon compounds, Titanium compounds, Dioxides, Zirconium compounds, Ethylenes, Glycols, Epoxy resins.) (Electric arcs, Stability.) (Welded joints, Mechanical properties, Microstructure.) Feasibility studies.

This report presents the results of a research project in which attempts were made to weld unalloyed Mo, Mo - 1/2 Ti, and Ti-Zr-Mo (TZM) alloy with conventional tungsten inert gas (TIG) welding equipment and a suitable flux. Although the fluxes had an apparent beneficial effect when compared to welds made without them, their conductivity caused erratic welding characteristics to prevail, and no satisfactory welds were achieved. Suggestions are given for further research to overcome the conductivity problem so an accurate evaluation of the flux concept may be made. (Author)

AD-266 200 Div. 26, 17
(TIPTM/EJH) OTS price $9.10

Universal-Cyclops Steel Corp., Bridgeville, Pa.
TUNGSTEN SHEET ROLLING PROGRAM.
Interim technical progress rept. no. 2 on Phase II, 11 Apr-11 Aug 61,
by W. J. Schoenfeld. Oct 61, 99p. incl. illus. tables.
(Contract AF 33(600)41917)
(AMC TR 7-827 (II)) Unclassified report

DESCRIPTORS: (*Tungsten, Powder metals, *Powder metallurgy, Electrodes, Manufacturing methods.) (Processing, Melting, Heat treatment, Casting, Forging, Extrusion, Rolling mills.) (Vacuum apparatus, Electric arcs, Forge presses.) (Microstructure, Mechanical properties, Physical properties, Specifications.) (Sheets, Castings.)

Satisfactory ingots can be produced with consistent quality on a small scale. The success of this operation is highly dependent upon the characteristics and quality of the starting material. Additional work, principally in the area of electrode manufacture, will be required before large ingots can be produced successfully. Although some work can be induced into ingots by direct forging, this method does not lend itself to satisfactory sheet bar production. Extrusion to rounds and sheet bar can be accomplished successfully using the parameters established. Press forging of extruded rounds presently represents the best method of producing sheet bar. (Author)

AD-266 207 Div. 26, 14
(TIPTM/GEC) OTS price $1.10

Vermont U., Burlington.
THE EFFECTS OF USING A HEATED MANDREL ON THE FLEXURAL STRENGTH OF WOUND LAMINATES,
by Joseph T. Matta and John O. Outwater.
18 Oct 61, 7p. incl. table (Technical memo. no. 173)
(Contract Nonr-321901, Proj. NRL 62 R05 19A)
Unclassified report

DESCRIPTORS: (*Laminates, Temperature, Stresses, Thermal stresses, *Thermal expansion, Filament wound construction.)

NOL type rings were prepared on a cold mandrel, maintained at room temperature, and a hot mandrel, maintained at cure temperature. All rings were processed at the same cure schedule: 24 hours at 250 F. The results show an increase of 12.8% in the flexural strength of the specimens wound on the hot mandrel over those wound on the cold mandrel. This may be attributed to the difference in coefficient of expansion between the mandrel and the glass causing undue stress in the glass when the glass is wound on a cold mandrel and then cured at 250 F. (Author)

AD-266 247 Div. 26, 28, 30
(TIPTB/CCH) OTS price $2.60

Carnegie Inst. of Tech. Graduate School of Industrial Administration, Pittsburgh, Pa.
MULTI-SHIP, MULTI-SHOP WORKLOAD SMOOTHING PROGRAM.
Rept. on Planning and Control of Industrial Operations,
by F. K. Levy, G. L. Thompson, and J. D. Wiest.
Oct 61, 26p. incl. illus. tables (Research memo. no. 87)
(Contract Nonr-76001, Proj. NR 047011)
Unclassified report

Original contains color plates: All ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Programming, Scheduling, *Labor, Shipyards, Mathematical computer data, Industrial production.) Probability, Job analysis, Military requirements.

This paper describes a computer program that uses simple rules and applies them probabilistically to minimize manpower requirements in shops of a naval shipyard. Preliminary runs on a small fictitious problem show that this multi-ship, multi-shop workload smoothing program may be able to reduce the maximum number of men required on any one day between 30 and 60%. (Author)

AD-266 249 Div. 26, 17
(TIPTM/BRW) OTS price $1.10

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC WELDING OF REFRACTORY METALS.
Progress rept. no. 3, 1 June-31 July 61,
by C. R. Frownfelter. 25 Oct 61, 6p. incl. illus. table.
(Contract NOw 61-0410-c)
Unclassified report

Division 26 - PRODUCTION AND MANAGEMENT

DESCRIPTORS: (Heat resistant alloys, *Refractory materials, *Welding, Spot welding by *Ultrasonics.) (Metals, Alloys, Molybdenum alloys, Titanium alloys, *Niobium alloys, *Tungsten, Sheets.) (Spot welding, Machines, Pressure, Transducers, Power supplies.) Spot welds, Tensile properties, Mechanical properties, Shear stresses, Microstructure.

The effect of input power, clamping force, and duration of welding interval on the tensile-shear strength of ultrasonic welds in 0.005-in. Mo-0.5% Ti alloy sheet were studied and the results are tabulated. Exploratory tensile-shear measurements were made in 0.010-in. Mo-0.5% Ti alloy sheets welded with 1800 w applied for 0.6 sec and clamping force levels of 400 and 350 lb. No correlation between weld strength and clamping force was obtained for 0.005-in. W sheets welded at 1600 w, a weld interval of 0.3 sec, and clamping forces from 300 to 900 lb. The effects of etching and degreasing of 0.005-in. D-31 alloy prior to welding were compared.

AD-266 253 Div. 26, 17
TIPTM/BRW) OTS price $3.60

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
MOLYBDENUM ALLOY EXTRUSION DEVELOPMENT PROGRAM.
Interim technical engineering rept. no. 3, 15 May-15 Aug 61,
by P. A. Santoli. Oct 61, 32p. incl. illus. tables.
(Contract AF 33(600)40861, Proj. 7-785)
(ASD TR 7-785, pt. 3) Unclassified report

DESCRIPTORS: (*Molybdenum alloys, Titanium alloys, Zirconium alloys, *Extrusion, Forging, Casting, Processing, Mechanical properties, Microstructure, Hardness, Creep, Rupture, High temperature research.)

The evaluation of solid round extrusions of cast and wrought TZM was completed. Results are given on mechanical and metallurgical properties. The extrusions were characterized by a wide difference in microstructure from front to back and by the lack of a uniformly strain-hardened structure. Regardless of extrusion-billet temperature, a more uniform, fine grain macrostructure was found for wrought-billet extrusions than that found for cast-billet extrusions. Creep-rupture tests of forged TZM in the recrystallized condition were completed at 2000, 2400, and 3000F in vacuum. Results at 2000 and 2400F are comparable with those reported in the literature for TZM of similar chemical analysis and metallurgical condition. Creep-rupture test results at 3000F indicated that desirable properties for T-shape extrusions at this temperature will be unlikely. (Author)

AD-266 294 Div. 26, 15, 30
(TIPTP/MFA) OTS price $2.60

Cornell U. Sibley School of Mechanical Engineering, Ithaca, N. Y.
USE OF THE MILITARY STANDARD PLANS FOR HAZARD RATE UNDER THE WEIBULL DISTRIBUTION,
by Henry P. Goode and John H. K. Kao. Oct 61, 15p. tables (Technical rept. no. 7)
(Contract Nonr-40143)
Unclassified report

DESCRIPTORS: (*Reliability, *Quality control, *Hazards, Failure, Time, Life expectancy.) (Statistical analysis, Statistical distributions, Probability, Sampling, Tests, *Tables.)

A procedure, together with necessary tables of products, for applying MIL-STD-105B plans to acceptance sampling inspection when the quality of items in the lot is evaluated in terms of the instantaneous failure rate or hazard rate as a function of time is presented. Inspection of sample items is by attributes with life testing truncated at the end of some pre-assigned period. The Weibull distribution (including the exponential as a special case) is assumed as the underlying life-length model. Examples of application are given. (Author)

AD-266 298 Div. 26
(TIPTP/MFA) OTS price $3.60

Minnesota U., Minneapolis.
SURVEILLANCE PROBLEMS,
by Richard Savage. 1 Oct 61, 31p. (Technical rept. no. 14)
(Contract Nonr-71031, Proj. NR 042 003)
Unclassified report

DESCRIPTORS: (Machines, Production, Processing, *Management engineering.) (Statistical analysis, Quality control, *Scheduling, Probability, Distribution theory. Sampling.) (Equations, Time, Costs.)

The surveillance of a machine which produces output in a continuous stream when it is not in the repair state is discussed. The objective is to maximize the long run average income per unit of time. The basic block of time is called a cycle which is the time from beginning production after repair until the recurrence of that event. The cycle length will in general be a random variable. (Author)

AD-266 381 Div. 26, 14
(TIPTM/BRW) OTS price $1.75

National Bureau of Standards, Washington, D. C.
STUDIES OF THE PARTICLE-IMPACT PROCESS FOR APPLYING CERAMIC AND CERMET COATINGS.
Final summary rept. on Surface and Interface Phenomena of Matter,
by D. G. Moore, A. G. Eubanks and others.
Aug 61, 52p. incl. illus. tables, 27 refs.
(Contract AF 33(616)58-19, Proj. 8(88-7022)
(ARL-59) Unclassified report

DESCRIPTORS: (*Flame spraying, *Refractory coatings, *Ceramic coatings, Coatings of *Cermets and Aluminum compounds, Oxides as Powders and Rods.) (Particles on Glass, Metals, Stainless steel, Copper, Iron, Platinum, Surfaces, Velocity, Abrasion, Determination by High speed photography.) (Deposits, Crystal structure, Microstructure, Bonding, Surface properties, Tensile properties, Shear stresses, Penetration, Cooling, Heat transfer.)

A basic study was made of the particle-impact process for applying coatings of aluminum oxide with rod and powder-type flame-spraying guns. The coatings were found to consist primarily of the softer eta phase rather than the harder and more stable alpha form of alumina. It was established that the eta phase forms because of the high quenching rates, of the order of 800,000 C/sec. on a stainless steel substrate, and 34,000 C/sec. on glass. Size and velocity measurements were made for particles from both gun types. High-speed motion pictures showed that the powder guns sprayed particles continuously; the rod gun in bursts. A chemical bond sufficient to with-

stand interfacial stresses without spontaneous failure was developed between the coating and smooth glass substrates, but never between the coating and smooth metal. It was shown that the apparent bond strength between the coating and iron increased exponentially with increasing roughness of an iron surface, rather than linearly. (Author)

AD-266 480 Div. 26
(TIPTM/BRW) OTS price $3.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
AUTOMATED WELDING OF JOINTS WITH ARBITRARY DIRECTION,
by N. S. L'vov. 13 Oct 61, 39p. incl. illus. 14 refs. (Trans. no. MCL-1247 of Sistemy Avtomaticheskogo Regulirovaniya I Upravleniya Nekotoryye Voprosy Teorii i Tekhniki, Moscow, pp. 150-167, 1959)
Unclassified report

DESCRIPTORS: (*Welded joints, Arc welds, Arc welding, Welding, Automation, Control systems, Electric arcs, Welding rods, Wire.) Technological intelligence, Translations, USSR.

AD-266 483 Div. 26, 17
(TIPTM/BRW) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
HIGH-FREQUENCY METAL SPRAYING.
20 Oct 61, 5p. incl. illus. (AID rept. 61-145, trans. of Vysokochastotnaya Metallizatsiya (High-frequency Metal Spraying). Moskva, Mashgiz, 121p. 1960)
Unclassified report

DESCRIPTORS: (*Flame spraying, Metals, Wire, Melting, *Induction heating, High frequency, Electric currents.) (Metal coatings, Steel, Mechanical properties, Physical properties, Hardness, Chemical analysis.) (Technological intelligence, Translations, USSR.)

This book is a presentation of the theoretical basis and the results of an experimental study of a method of metal spraying in which the coating metal, drawn into wire, is melted by high-frequency induction current instead of by an electric arc or by gas flame. Theoretical analysis indicates that through the use of high-frequency current it is possible to heat certain specific metal wires at an optimal rate so that metal coatings of desired chemical composition and improved physical and mechanical properties can be obtained. (Author)

AD-266 514 Div. 26, 17, 12
(TIPTM/EJH) OTS price $23.50

Douglas Aircraft Co., Santa Monica, Calif.
SYMPOSIUM. WIDE, CLOSE-TOLERANCE STEEL SHEETS.
Final technical engineering rept. Dec 59-June 61, ed. by Bernard B. Moss. Oct 61, 1v. incl. illus. tables.
(Contract AF 33(600)42793)
(ASD TR 61-7-787a)
Unclassified report

DESCRIPTORS: (*Stainless steel, *Steel, *Sheets, Rolling mills, Production, Processing, Manufacturing methods, Explosive forming, Heat treatment, Tests, *Symposia.) Rocket cases, Guided missiles, Aircraft, Airframes.

The data presented indicate that wide steel sheets were produced with satisfactory metallurgical properties and to tolerances approximately half of the present standard width tolerances. Large diameter missile forward closures and aircraft bulkheads were formed from wide single sheets by explosive forming and shear forming. Missile motor cases which tested satisfactorily were produced by the roll-and-weld technique, from wide steel sheets using a single sheet in a 360-degree wrap. (Author)

AD-266 572 Div. 26, 17
(TIPTM/EJH) OTS price $10.50

Metcut Research Associates, Cincinnati, Ohio.
MACHINING OF REFRACTORY MATERIALS.
Technical engineering rept. on Phase 2, 1 Aug-31 Oct 61,
by L. J. Nowikowski, N. Zlatin, and M. Field.
Nov 61, 132p. incl. illus. tables.
(Contract AF 33(600)42349, Proj. 7-532a)
(ASD TR 7-532a, Vol. 4)
Unclassified report

DESCRIPTORS: (Alloys, *Heat resistant alloys, *Metals, *Refractory materials, Steel, Tungsten, Niobium, Molybdenum alloys, Titanium alloys, Zirconium alloys, Niobium alloys, Nickel alloys, Cobalt alloys, Chromium alloys, *Machining, Machine tools.) (Drilling machines, Milling machines, Grinders, Cutting tools, Lathes, Machine shop practices, Carbide tools.) (Heat treatment, Processing, Manufacturing methods.)

Machining studies were performed on pressed and sintered unalloyed W, TZM Mo alloy, unalloyed Nb, D-31 Nb alloy, Rene 41 solution treated to 321 BHN and Rene 41 aged to 365 BHN. The investigation consisted of turning, face milling, end milling and grinding tests on tungsten; turning, face milling, drilling and grinding tests on molybdenum; drilling and grinding tests on columbium; and drilling, face milling, end milling, slotting and grinding tests on Rene 41. (Author)

AD-266 711 Div. 26
(TIPTM/BRW) OTS price $2.25

Vitro Labs., West Orange, N. J.
FABRICATION OF CUTTING TOOLS BY ELECTROPHORETIC DEPOSITION.
Technical engineering rept., 23 May 60-7 July 61, on Phases 1 thru 4,
by M. H. Ortner and K. A. Gebler. Oct 61, 88p. incl. illus. tables (Rept. no. VL-2211-14-0)
(Contract AF 33(600)41436)
(ASD TR 61-7-868) Unclassified report

DESCRIPTORS: (*Cutting tools, *Manufacturing methods, *Electrophoresis of Coatings, Ceramic coatings, Cermets, *Carbides of Tungsten compounds with Cobalt, Boron, Silicon on Tool steel and Nickel alloys, Iron alloys, Cobalt alloys or Tungsten alloys, Nickel alloys, Copper alloys.) (Alloys for Airframes, Machining.) (Tests on Lathes of Cutting tools and Drills.)

The technical feasibility of fabricating carbide coated cutting tools by the electrophoretic deposition process was demonstrated. Carbide coated lathe tool inserts were prepared which were equal or superior in tool life to commercial, solid, Type-C-6 carbide lathe tools in turning AISI 4340 steel, quenched and tempered to 300 and 500 BHN, at speeds to 200 f.p.m. Carbide coated, 1/4-in.-diam spade drills were produced which yielded a three-fold increase in tool life over an uncoated, Type T-15 cobalt HSS drill of the same geometry. (Author)

AD-266 741 Div. 26, 17
(TIPTM/BRW) OTS price $2.60

Beryllium Corp., Reading, Pa.
BERYLLIUM CASTING.
Interim technical engineering rept. no. 10, 5 July-4 Nov 61 on Phase III,
by B. H. Hessler and J. P. Denny. 4 Nov 61, 22p. incl. illus. tables.
(Contract AF 33(600)37902; ASD Proj. 7-643)
Unclassified report

DESCRIPTORS: (*Beryllium, Processing, Melting, *Casting, Impurities, Oxidation, Mold washes, Molding materials, Purification.) (Castings, Fracture (Mechanics), Grains (Metallurgy), Growth, Control, Microstructure.) (Radiographic analysis, Microscopy, Test methods.)

Methods were developed for the production of sound 3-in.-diam vacuum cast Be billets for fabrication. The casting technique relies on a thermal gradient within the mold (hot top, cold bottom) to control directional solidification of the metal and eliminate the centerline shrinkage. The thermal gradient casting technique was reliable and reproducible. Ingots showed no indication of cracking as determined by radiographic tests and sectioning. Flat Be slabs have also been cast using this technique, and are being evaluated. (Author)

AD-266 742 Div. 26, 30
(TIPTB/LH) OTS price $2.25

Naval Supply Research and Development Facility, Bayonne, N. J.
PERFORMANCE OF TESTS REQUIRED IN SPECIFICATION MIL-P-116D.
Summary rept. no. 3,
by S. Stambler. 27 Mar 61, 77p. incl. illus. tables (Engineering rept. no. 2.5005)
Unclassified report

DESCRIPTORS: (*Packaging, *Specifications, Military requirements, Test methods, Tests, Quality control.)

Military Specification MIL-P-116D Preservation, Methods of delineates the requirements for the cleaning, preservation and packaging of items, equipment and materials for protection against corrosion, physical damage and other forms of deterioration during handling, shipment and storage. This report details the procedures to be followed in performing the tests in order to determine conformance to the specification. (Author)

AD-266 751 Div. 26, 17
(TIPTM/BRW) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PRODUCTION ENGINEER'S HANDBOOK,
by B. G. Gutkin, Ye. N. Levinson and others. 16 Oct 61, 20p. incl. illus. table (Trans. no. FTD-TT-61-6 of Spravochnik Tekhnologiya - Mashinostroitela 1:403 and 424-430, 1958)
Unclassified report

DESCRIPTORS: (*Handbooks, *Metals, *Processing by Electrolytes and Electricity, Electrodeposition, Electroerosive machining, Electroforming, Electrolytic polishing, Electrochemistry, Electric currents, Electric discharges, Heating, Heat treatment, Hardening of Surfaces, Soldering, Spark machining, Hydrostatic pressure.) Technological intelligence, Translations, USSR.

AD-266 752 Div. 26
(TIPTW/RD) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
GROUP PROCESSING IN THE VORONEZH MACHINE CONSTRUCTION PLANT,
by D. V. Dobrozrakov. 31 Oct 61, 5p. (Trans. no. FTD-TT-61-9 of Gruppovaya Tekhnologiya v Mashinostroyenii i Priborostroyenii, pp. 114-116, 1960)
Unclassified report

DESCRIPTORS: (Technological intelligence, USSR, Translations.) (*Manufacturing methods, Production, Processing, Machining.) (Milling machines, *Machines, Machine tools.) (*Industrial plants, *Industrial production, USSR, Industrial equipment.)

AD-266 762 Div. 26, 17
(TIPTM/BRW) OTS price $12.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
THEORY OF SPECIAL KINDS OF CASTINGS (SELECTED CHAPTERS) (Teoriya Osobykh Vidov Lit'ya),
by A. I. Veynik. 27 Oct 61, 173p. incl. illus. table (Trans. no. HCL-177 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostrontel'noy Literatury Moscow, pp. 15-142 and 278-290, 1958)
Unclassified report

DESCRIPTORS: (*Industrial production, *Castings, Automation, Machines, Analysis, Design, Theory.) (Metals, Liquids, Fluid flow, Heat transfer, Crystallization to Solids by Cooling, Thermodynamics.) Mechanical engineering, Technological intelligence, Translations, USSR.

AD-266 763 Div. 26
(TIPTM/LSK) OTS price $8.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
SOME PROBLEMS IN ORGANIZATION, PLANNING, AND ECONOMICS OF THE AIRCRAFT INDUSTRY (Nekotoryye Voprosy Organizatsii, Planirovaniya i Ekonomiki Aviatsionnogo Proizvodstva).
25 Aug 61, 94p. incl. illus. tables (Trans. no. MCL-998 of Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti Moskva, 69p., 1959)
Unclassified report

DESCRIPTORS: (*Aircraft industry, USSR, *Industrial production, Economics, Scheduling, Theory, *Translations, Technological intelligence.)

Calculations and analyses are made of prime costs of aircraft production, of planning and control of production, as well as standardization of the work processes. A new method is proposed for expanded calculation of prime cost of production. Under conditions of frequency change in items of production, considerable differences are presented by the preliminary calculation of prime production cost, since the necessary initial data are lacking. The method makes it possible to overcome these difficulties and to determine with a sufficient accuracy the prime production cost even prior to the presence of a detailed developed technology of its preparation. The problems involved in the planning of production and the practice existing for planning and control of the expenditure of wage reserves are discussed. The problem of determining the index of completeness of production during analysis and estimation of results of the work is treated. Shortcomings are indicated which exist in determining the production capabilities of aircraft factories. Several ways of eliminating these shortcomings in the selection of leading groups of equipment, leading sectors and shops, and also in the determination of a planned time reserve are suggested. (Author)

AD-266 772 Div. 26
(TIPTB/LH) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
PROBLEMS IN MECHANIZATION AND AUTOMATION UNDER SERIES MANUFACTURING CONDITIONS,
by S. P. Mitrofanow. 24 Oct 61, 29p. incl. illus. (Trans. no. MCL-1397 of Feingeraete Technik, Issue no. 5:199-209, May 61)
Unclassified report

DESCRIPTORS: (*Translations, *Technological intelligence, *Manufacturing methods, *Automation, *USSR.)

AD-266 819 Div. 26, 27
(TIPTM/BRW) OTS price $2.60

Ingersoll Kalamazoo Div., Borg-Warner Corp., Mich.
FABRICATION OF LARGE DIAMETER TITANIUM PRESSURE VESSELS BY THE SPIRAL WRAP METHOD.
Progress rept. no. 4, 1 July-30 Sep 61,
by R. E. Angerman. 15 Oct 61, 29p. incl. illus. tables.
(Contract DA 20-018-ORD-22890, Proj. OMS 5010. 11.80800.51.14)
Unclassified report

DESCRIPTORS: (*Pressure vessels, *Rocket cases, *Manufacturing methods, Steel Titanium, Titanium alloys, Sheets, Laminates, Sandwich construction, Bonding, Adhesives.) (Lathes, Tools, Design, Operation.) (Steel tubing, Titanium tubing, Cylindrical bodies, Aluminum alloys, Production.) Tests.

Progress is reported on (1) the fabrication of 18 steel (AM 355) tubular specimens and testing of units for aging and vibration, (2) fabrication and testing of 118 uniaxial tensile and flexural specimens for establishment of design values, and (3) fabrication and testing of 20- and 40-in.-diam Ti strip specimens. Tooling design and fabrication is evaluated as it relates to 20-in. diam specimens and how it will affect the 40-in. diam tooling. A portion of the end closure design work is presented. The design of helically wound tube sections should incorporate the greatest possible number of metallic layers to utilize the maximum strength in the metal. Rolled and welded Al plate should be considered for helically wound tube mandrels. Restraining the tubular specimens during cure of the adhesive should eliminate the problem of machining the inside bore of the restraining device and reduce the mass of metal which must be heated to effect adhesive cure. (Author)

AD-266 927 Div. 26, 17, 1
(TIPTP/MFA) OTS price $1.50

Defense Metals Information Center, Columbus, Ohio.
TITANIUM IN AEROSPACE APPLICATIONS,
by R. I. Jaffee, W. H. Sharp, and R. S. Nycum.
24 Oct 61, 56p. incl. illus. tables (DMIC memo. no. 133)
Unclassified report

DESCRIPTORS: (*Aircraft, Materials, Design, *Titanium, Titanium alloys, Industry, Aircraft industry, Industrial production, Statistical data.) (Mechanical properties, Physical properties, Heat treatment, Deformation, Stresses, Tensile properties, Fatigue (Mechanics).) (Processing, Forging, Structures, Sandwich construction.) Airframes.

AD-267 011 Div. 26, 17, 12
(TIPTM/BRW) OTS price $4.60

American Machine and Foundry Co., Alexandria, Va.
DEPOSITION FOR THE PRODUCTION OF STRUCTURE.
Interim progress rept. no. 1, 1 Aug-1 Nov 61,
by M. E. Browning. 1 Nov 61, 42p. 27 refs.
(Contract AF 33(657)7016)
Unclassified report

DESCRIPTORS: (Materials for Spaceships, Satellite vehicles, *Structures, Production, *Processing, Electrodeposition, Electroforming, Electrophoresis, Flame spraying, Vapor plating, Feasibility studies, *Metal coatings, Heat resistant alloys, Refractory materials, Metals, Alloys.) Molybdenum alloys, Nickel alloys, Tantalum alloys.

Investigation was initiated to determine the feasibility of depositing free-standing structures from representative advanced metals and alloys applicable to both current and future aerospace vehicle designs. The literature and technology survey has proceeded well and will be soon concluded. The most promising deposition

processes are vapor deposition, electrode-position, electrophoresis, combinations of the latter two, and metal spraying. Preliminary material studies indicate that nickel-base superalloys and molybdenum and tantalum refractory alloys have very high application potentail for the selected structure deposition processes. Anticipated fabrication and processing problems, supported by basic laboratory experiments, are being cataloged and analyzed. (Author)

27. PROPULSION SYSTEMS

AD-266 126 Div. 27, 20
(TIPTM/GEC) OTS price $6.60

RCA Victor Co., Ltd. (Canada).
SULFUR HEXAFLUORIDE AS A FUEL FOR IONIC PROPULSION.
Final rept.,
by G. G. Cloutier and W. A. Evans. June 61, 60p. incl. illus.
(Contract AF 33(616)7437)
Unclassified report

DESCRIPTORS: Rocket propulsion, *Ion rockets, Ion sources, Electron bombardment, *Rocket fuels, *Sulfur compounds, *Fluorides, Design, Mass spectroscopy, Electric propulsion, Electron beams.

Experiments on the generation of an intense beam of SF6(-) negative ions by an electron bombardment method are described. Theoretical considerations are given on the basic processes for the generation of negative ions, the characteristics of an electron bombardment ion source and the relevant properties of the sulfur hexafluoride molecule. The feasibility of introducing the gas in the ion source in the form of a well defined stream is demonstrated to ensure a high ion conversion efficiency for this ion source. Time-of-flight-mass spectrometer measurements indicated that only SF5(-) and SF6(-) ions were produced in that source and that the SF5(-) contribution to the total ion current was negligible. The negative ion current as function of the electron bombarding energy exhibits a complex resonance spectrum. The limitation to the maximum negative ion current produced by this method is set by space charge effects in the bombarding electron beam. (Author)

AD-266 168 Div. 27, 1
(TIPTA/SEB) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
CATEGORY II YJ AND J85-GE-5 ENGINE FOLLOW-ON EVALUATIONS.
by Thomas H. Hobbs and Swart H. Nelson. Oct 61, 44p. incl. illus. (Rept. no. AFFTC-TR-61-54)
Unclassified report

DESCRIPTORS: (*Turbojet engines, Flight testing, Reliability.) Afterburners, Fuel consumption, Thrust, Failure (Mechanics), Stalling, Starting.

Evaluations were made of (1) YJ engine component improvements, (2) J engines in the production configuration being delivered in the first operational T-38 aircraft, and (3) a modified production J engine (General Electric Operation Nutcracker. (Author)

AD-266 654 Div. 27
(TIPTA/LSK) OTS price $1.10

Research Information Service, New York.
AN EXPERIMENTAL ENGINE WITH A ROTARY PISTON.
1961, 7p. (Trans. nos. E 815 and T 1025)
Unclassified report

DESCRIPTORS: *Internal combustion engines, Theory, Pistons, Rotation, Translations, Design.

The engine has a piston (rotor) that rotates about its own axis, which itself executes a circular movement. The piston has the form of a three-sided prism with convex working surfaces and is eccentrically mounted on the toothed engine shaft. The three faces of this piston describe a path resembling an oval somewhat contracted along its minor axis (a two-arched epitrochoid). In this type of engine the piston housing does not rotate; there is only one sparking plug and this is mounted in the piston housing. The inlet and exhaust system consists of ports that are opened by the piston as in a two-stroke engine, although on the basis of the working cycle the engine is a four-stroke type. The piston housing can be liquid or air-cooled; the three-sided piston, from which only an inconsiderable amount of heat is transferred to the wall of the piston housing, is cooled by oil supplied through the hollow shaft. (Author)

AD-266 664 Div. 27, 17, 30
(TIPTA/SEB) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS.
Progress rept. no. 17 for month ending 31 Oct 61, by Gerald M. Gordon. 7 Nov 61, 7p. incl. illus. table.
(Contract NOrd-18619)
Unclassified report

DESCRIPTORS: (Rocket motors, Solid rocket propellants, *Rocket motor nozzles, *Tungston, Erosion, Thermal stresses, Shock, Tests, Mathematical analysis.) (Erosion, Plasma jets, Flame spraying, Alminum compounds, Oxides, Exhaust gases, Simulation.) (Stresses, Thermal stresses, Strain gages, Test methods, Test equipment.)

Erosion experiments were made on small tungsten rods with Al2O3 in the plasma flame at temperatures near the melting point of W. The specimens, 5/32-inch-diameter tungsten Heli-arc electrodes approximately 3-1/2 inches long (2% thorium, close to 100% theoretical density), were positioned coaxially with the plasma flame and the tip temperature was measured with an optical pyrometer which had been calibrated for experimental conditions at the melting point of tungsten. Erosion parameters measured were the change in specimen length, and the weight loss or gain. Al2O3 alone does not cause significant

erosion of W. A mathematical calculation of the thermal stresses on the outer ring fiber is given. It is therefore desirable to be able accurately to measure or calculate the thermal stress on the outer ring fiber. (Author)

AD-266 699 Div. 27, 9
(TIPTA/VGW) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF NET-THRUST AND BASE-PRESSURE CHARACTERISTICS OF CYLINDRICAL AFTERBODIES WITH CLUSTERED SUPERSONIC NOZZLES AT TRANSONIC MACH NUMBERS,
by Earl H. Andrews, Jr. Nov 61, 46p. incl. illus. (NASA Technical note no. D-978)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note no. D-978.

DESCRIPTORS: (*Rocket motor nozzles, Supersonic nozzles, Cylindrical bodies, Wind tunnel models, Aerodynamics, Transonic flow, Drag, Pressure, Thrust, Measurement, Model tests, Tests in Wind tunnels.)

A wind-tunnel investigation was conducted at Mach numbers from 0.9 to 1.4. Design Mach numbers of the nozzles were 2.0 and 2.5 and the number of clustered nozzles ranged from two to six. The nozzles had throat-to-base diameter ratios of 0.155, 0.225, 0.278, and 0.320. Some models were tested with various configurations of extended, shrouded, flush, and canted nozzles. The nozzles discharged unheated air from the base at ratios of jet total pressure to free-stream static pressure ranging from 1 to approximately 20. Results showed that both the ratio of total exit area to base area and the number of jets affect the net-thrust factor to a significant degree for the extended-nozzle configurations. Good net-thrust factors were obtained with all the model configurations near the design jet total-pressure ratio; however, the extended-nozzle configuration had the highest net-thrust factor over the test jet total-pressure-ratio range. Canting the twin nozzles outward resulted in a favorable thrust factor over a limted jet total-pressure-ratio range. (Author)

AD-266 767 Div. 27, 18, 10
(TIPTB/LH) OTS price $19.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
OPERATING CYCLES IN HEAT ENGINES (COLLECTION OF ARTICLES) (Rabochiye Protsessy V Teplovykh Dvigatel' Nykh Ustanovkakh).
13 Sep 61, 328p. incl. illus. tables (Trans. no. MCL-1173 of Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Oborongiz, Moskva, 174p., 1960)
Unclassified report

DESCRIPTORS: (*Translations, *Technological intelligence, Jet engines, *USSR.) (Fuels, Mixtures, *Jets, *Fuel sprays, Ignition, Combustion.) (*Turbine blades, Heat.) (Plasma physics, *Plasma jets.)

Contents:
Transient combustion processes in engines, by D. I. Abugov
High-temperature, high-power stabilized electric arcs (Electric Arc Plasmotrons), by V. B. Tikhonov and Ye. A. Yakovlev
Distribution of liquid in a spray with impinging jets, by I. G. Panevin
On atomizing liquids by sprayers with impinging jets, by I. G. Panevin
Investigation of the spreading over a wall of an axially symmetrical jet, by V. A. Kurochkin
Experimental investigation of the effect of vibration of pipes on the parameters of the liquid flowing in them, by L. A. Latyshev, N. B. Rutovskiy and V. B. Tikhonov
Regeneration of heat in liquid propellant rocket engines, by A. V. Kvasnikov
Cooling of short working turbine blades by means of heat removal to the cooled root, by A. F. Shtyrlin
On the possibility of utilizing binary compounds for model study of turbines, by V. M. Tyugin

AD-266 771 Div. 27, 1
(TIPTA/VGW) OTS price $2.60

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
GAS TURBINE ENGINES IN SHORT OR VERTICAL TAKE-OFF AND LANDING AIRCRAFT (Gasturbinentriebwerke in Kurz-bzw. Senkrechtstart - Und Landeflugzeugen),
by D. Wattky. 1961, 20p. incl. illus. tables. (Trans. no. MCL-1392 of Deutsche Flugtechnik 5:188-197, 1961)
Unclassified report

DESCRIPTORS: (Airplane engines, *Gas turbines, Jet engines, Turbofan engines, Jet propulsion for Short take-off planes, Vertical take-off planes.) (Germany, Translations.) Aerodynamic data.

A review is given of the employment possibilities of gas turbine power plants in STOL-, VTOC- and VTOL-aircraft. The development of new gas turbine engines for VTOL-aircraft was generally discontinued while conventional gas turbines are made serviceable for special VTOL purposes of take off, e.g. by traversing the engine, deflection of gas jet; thrust nozzle rotation, and jacketed fans. A prime requirement exists for low engine mass/thrust ratio exemplified by the light weight jet turbine RB.108 of the Rolls-Royce Ltd. Mention is made of the special VTOL-gas turbine by Bristol-Siddeley Engines Ltd. which is provided with a turbofan, the type designation of which is still unknown. Data pertaining to gas turbine engines used in VTOL-aircraft are tabulated. (Author)

AD-266 825 Div. 27, 26 17, 12
(TIPTA/VGW) OTS price $4.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES.
General rept. no. 10, 31 May-30 June 61,
by Wayne A. Martin. 30 June 61, 44p. incl. illus. tables.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: (Non-destructive testing of *Rocket cases, Rocket motors for Guided missiles Underwater to surface, Surface to surface.) (Tests for Hydrostatic pressure.) (Metallurgical analysis of Hardness, Grains (Metallurgy), Microstructure, Mechanical properties, Tensile properties, Quality control, Processing, Drawing (Machine processing).)

Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

AD-266 858 Div. 27, 14
(TIPTA/LSK) OTS price $4.60

Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT OF FLEXIBLE POLYMERS AS THERMAL INSULATION IN SOLID-PROPELLANT ROCKET MOTORS.
Quarterly progress rept. 1 July-1 Oct 61,
by N. Vasileff, T. Walton, and J. Duffy.
13 Oct 61, 37p. incl. illus. tables.
(Contract DA 36-034-ORD-3325-RD)
Unclassified report

DESCRIPTORS: (Solid rocket propellants, Combustion, Rocket motors, *Combustion chamber liners, Thermal insulation.) (*Insulating materials, Resins, Epoxy resins, Amines, Phenolic resins, Heat resistant polymers, Polymers, Physical properties, Mechanical properties.)

Flexible epoxy, melamine, and phenolic resins were developed. Some of the more promising were tested in static motor firings. Data for the best materials developed to date are tabulated. Char rates obtained in the same motor firing are reported for one of the commercially available materials, U. S. Rubber Company's 3015. Motor firings and oxyacetylene torch tests have shown several other phenolic-Syl Kem 90 formulations, a 1:1 modification of Epon 815 with XR2000, and a 1:1 modification of Epon 828 with EM206, to have good insulation properties. (Author)

AD-266 952 Div. 27, 26, 17, 12
(TIPTM/EJH) OTS price $2.60

Lyon, Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General progress rept. no. 10 and Quarterly rept. no. 3, 10 Apr-10 Aug 61.
10 Aug 61, 17p. incl. tables.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket cases, Production, Manufacturing methods, Drawing (Machine processing, Tools, Dies.) (Steel, Nickel alloys, Iron alloys, Titanium alloys, Coatings, Processing, Heat treatment, Drawing (Machine processing).) (Tests, Feasibility studies.)

AD-266 955 Div. 27, 26
(TIPTA/VGW) OTS price $1.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES.
General rept. no. 11, 30 June-31 July 61,
by Wayne A. Martin. 31 July 61, 9p. incl. tables.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: (Rocket motors, *Rocket cases, Processing, Production, Drawing (Machine processing), Metallurgical analysis, Mechanical properties, Tensile properties.) (Dies, Machine tools.)

AD-266 981 Div. 27, 25
(TIPTA/VGW) OTS price $3.60

Republic Aviation Corp., Farmingdale, N. Y.
THE ELECTROMAGNETIC PINCH EFFECT FOR SPACE PROPULSION,
by Alfred E. Kunen and William McIlroy. Aug 59, 22p. illus. 11 refs. (PPL Rept. no. 116)
(Contracts AF 49(638)552 and Nonr-285100)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Magnetic pinch, Low accelerators, Gas ionization, Electrodes for Rocket motor nozzles, Plasma jets, Specific impulse, Thrust, Measurement.) (*Ion rockets for Space probes, Mars, Space flight, Propulsion, Electric propulsion.) (Plasma physics, Instrumentation.)

The phenomenon of the electromagnetic pinch effect is used to accelerate ionized gases for space propulsion. Electrical energy, initially stored in capacitors, is discharged across two nozzle shaped electrodes wherein the radial pinch is converted to axial motion of the effected gases instead of confinement at the axis. The gas dynamics of a pinch using the hydrodynamical model of a magnetic piston driving a shock wave, is combined with the electrodynamics of the circuit to calculate the discharge behavior. Experiments on three different electrode designs are discussed and results compared with calculated values. Results are applied to one particular space propulsion system consisting of a nuclear energy source, a space radiator, a turbine-generator, capacitor, and a pinch tube. The specific mission analyzed is a one-way unmanned flight to a Mars orbit, starting from an Earth orbit. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-266 163 Div. 28, 30
(TIPTB/CW) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
PERCEPTION OF POSTURAL VERTICALITY BACKGROUND AND APPARATUS,
by Edwin W. Moore and Robert L. Cramer. Aug 61, 7p. incl. illus. 21 refs. (Rept. no. 61-84)
Unclassified report

DESCRIPTORS: (Visual perception, *Vertical perception, Proprioception, *Test equipment, Rotation, *Otorhinolaryngology.)

This paper describes an apparatus designed to tilt in the lateral plane and permits the recording of responses by an ink tracking. With this device, it will be possible to develop experimental research procedures to be used in vestibular physiology and standardized clinical technics to be used by Air Force otolaryngologists. (Author)

AD-266 211 Div. 28, 16
(TIPTB/MS) OTS price $.75

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A METHODOLOGICAL STUDY OF CONFINEMENT.
Rept. on Human Performance in Advanced Systems, by Donald W. Ormiston. Mar 61, 21p. incl. tables, 16 refs.
(WADD TR 61-258) Unclassified report

DESCRIPTORS: (*Confinement, Stress (Psychology), Stress (Physiology), Personality, Visual perception, Optical illusions, Tests, Measurement.)

Thirty-four subjects divided into two groups were confined for 8 hours in a lighted 5 by 8 foot cubicle where they worked occasionally on tracking, monitoring, and time estimation tasks and noted somatic complaints. Visual illusions were administered before and after confinement. Twenty subjects in another group underwent all of the tests but were not confined. A battery of personality tests was given to the subjects 1-3 months before they participated. Correlations among the personality test scores, the changes in the visual illusions, and the performance tasks were computed. The results of the performance tasks showed no significant differences between the confined and nonconfined groups. Time estimates did not vary significantly during confinement. Confirmatory evidence was gained favoring the use of the spiral after-effect and rejecting the latency of autokinesis as criterion measures of confinement stress. The personality-performance relationships explored did not substantiate previous findings. Cautions that should be observed in selecting and instructing the subjects for experiments of this sort are discussed. (Author)

AD-266 320 Div. 28, 30
(TIPTW/RD) OTS price $8.10

Psychological Research Associates, Inc., Arlington, Va.
A DATA ORGANIZATION MODEL FOR THE PERSONNEL SUBSYSTEM.
Rept. for July-Nov 60, on Technical Guides for Designers of Personnel Subsystem for New Weapon Systems,
by Melvin R. Marks. Sep 61, 74p. incl. illus. tables, 21 refs.
(Contract AF 33(616)5738, Proj. 1710)
(ASD TR 61-447) Unclassified report

DESCRIPTORS: (*Aviation personnel, Maintenance personnel, *Human engineering.) (Reports, Data processing systems, Data storage systems, Data, Coding.) (Guided missiles, Aircraft, Ground support equipment.)

The need for organizing personnel-equipment data (PED) for any system is discussed; development considerations and constraints for such a model are described. It is concluded that a model which organizes all system basic data will serve for PED as well. A model is adopted which represents an analogue of the system itself, the model acting as an index or table of contents to the data. A hierarchical organization of system levels is defined and a locator-code symbol is devised to be the address and description of type for any particular datum. Examples are given of the application of the model to various types of systems. Problems in implementing the model in any system are discussed. Appendices representing categories applicable to the basic data of any system are presented. There is some discussion of possible mechanization of data storage and retrieval in connection with the use of the model. (Author)

AD-266 344 Div. 28
(TIPTB/MS) OTS price $1.10

Bureau of Naval Personnel, Washington, D. C.
THE RELATIONSHIP BETWEEN CERTAIN PERSONALITY MEASURES AND DELINQUENCY RATE IN A NAVY SAMPLE, by Robert R. Knapp. Aug 61, 5p. incl. tables. (Technical Bull. no. 61-9)
Unclassified report

DESCRIPTORS: (*Personality, *Adjustment (Psychology), Naval personnel, Sociometrics, Measurement.) (Personality tests, Statistical analysis.)

Habitual delinquency is a problem of major concern to operating Navy personnel. Identification of personality characteristics associated with delinquency rate constitutes a first step in the development of measures for use in the early screening out of the habitual or frequent offender. The present study was conducted to determine whether personality scales measuring social maturity and conformity were related to delinquency rate in a group of brig confinees. Significant relationships were found between these scales and delinquency rate. Present findings suggest the advisability of investigating the predictive efficiency of measures of these personality characteristics in other military settings. (Author)

AD-266 403 Div. 28
(TIPTB/MS) OTS price $1.25

Institute for Applied Experimental Psychology, Tufts U., Medford, Mass.
ABSOLUTE IDENTIFICATION OF COLOR FOR TARGETS PRESENTED AGAINST WHITE AND COLORED BACKGROUNDS, Rept. on Human Performance in Advanced Systems, by Harold P. Bishop and Mason N. Crook. Mar 61, 42p. incl. illus. tables.
(Contract AF 33(616)5087, Proj. 7184)
(WADD TR 60-611) Unclassified report

DESCRIPTORS: (*Visual perception, *Colors, *Identification, Targets, Tests.)

The number of stimulus colors which can be absolutely identified by normal subjects when viewed against various colored backgrounds was investigated. Additive mixtures of light passed through narrow-band and Illuminant-C filters were projected onto a viewing screen by a device which permitted independent control of target and background characteristics. The stimulus parameters of hue, luminance, purity, target size, and target shape were varied, and the effects of such factors as training and the presence of a distracting task were studied. With target luminance above background luminance, about nine hues plus white, three luminance levels, and two purity levels, are estimated to be useful for operational coding, if no more than about 30 of the possible combinations are included in the set. Under optimal working conditions and with protracted training, the maximum size of an identifiable set is estimated to be about 60. Reduction of target luminance below the luminance of a colored background was found to make identification very difficult. No significant effect of target shape was found. (Author)

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AD-266 704 Div. 28, 1
(TIPTA/WAW) OTS price $15.00

Courtney and Co., Philadelphia, Pa.
IMPROVEMENT OF FLIGHT HANDBOOKS,
by Myron A. Fischl and Mark G. Pfeiffer. June 61, 221p. incl. illus. tables.
(Contract N61339-748)
(NAVTRADEVCEN 748-1) Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Aviation personnel, *Pilots, Maintenance personnel, Training, Military training, Human engineering.) (Airplanes, Handbooks, Instruction manuals.) (*Handbooks, Analysis, Effectiveness, Design.)

This study was designed to identify the specific inadequacies in flight manuals, and to recommend ways and means for their correction. To this end, the Navy pilot population was selectively sampled by questionnaires and interviews, while representative flight handbooks underwent critical analysis. Within the framework of determining realistic information requirements and optimizing the physical characteristics of the handbooks, the data derived from these two approaches were integrated. Specific problems associated with such factors as format, organization, color application, readibility, level of explanation, utilization practices, revision procedures, and kneepad/pocket checklists were treated. Recommendations for improvement of flight handbooks are presented with detailed instructions, illustrations, and rationale. (Author)

AD-266 861 Div. 28
(TIPTB/MS) OTS price $3.60

Personnel Lab., Aeronautical Systems Div., Lackland Air Force Base, Tex.
SIMILARITY OF FACTORS UNDERLYING PEER RATINGS OF SOCIALLY ACCEPTABLE, SOCIALLY UNACCEPTABLE, AND BIPOLAR PERSONALITY TRAITS,
by Ernest C. Tupes and Margorie N. Kaplan. June 61, 29p. incl. tables.
(Proj. 7717)
(ASD TN 61-48) Unclassified report

DESCRIPTORS: (*Personality, Factor analysis.) (*Personality tests, Design.)

Five well-defined factors were found to underly ratings of personality traits when the traits were expressed in bipolar form (e.g., Cooperative vs Obstructive). The present study investigated the factor structure underlying ratings when the traits were presented with socially acceptable definitions alone (e.g., Cooperative vs Not So); with socially unacceptable definitions alone (e.g., Obstructive vs Not So); as well as in the bipolar form. Five hundred members of the Air Force Command and Staff School Class of 1959 rated each other (in rating groups of 12 to 14 officers) using one or another of three forms designed to obtain bipolar and unipolar ratings. When the three intercorrelation matrices were factor analyzed, five factors emerged from each. These factors appeared to be the same five factors found in previous analyses. It was concluded that the factor structure underlying ratings of personality traits is unaffected by differences in the polarity of the rating definitions. (Author)

AD-266 864 Div. 28
(TIPTB/MS) OTS price $2.60

Test Research Service, Bronxville, N. Y.
MEASUREMENT OF MENTAL SKILLS EMPLOYED IN ARITHMETIC REASONING TESTS,
by Frederick B. Davis. Aug 61, 19p. incl. tables.
(Contract AF 41(657)232, Proj. 7717)
(ASD TR 61-99) Unclassified report

DESCRIPTORS: (*Aptitude tests, Design.) (*Aviation personnel, Selection.) (*Reasoning, Measurement, Statistical analysis.)

Arithmetic reasoning items are widely used in Air Force personnel selection tests because of their high reliability and validity for a wide range of performance criteria. With the objective of finding test items that measure the same abilities, but require less testing time, nine types of replacement items were tried in combination with a set of arithmetic reasoning items. It was found that the best combination of new items does measure the same abilities, but with no saving in testing time. Statistical analysis of data for the new tests and Arithmetic Reasoning provides information about the mental skills employed in solving arithmetic reasoning problems. Further development is proposed for the test, Estimating Answers, which was most closely correlated with Arithmetic Reasoning. (Author)

AD-266 865 Div. 28
(TIPTB/MS) OTS price $1.60

Personnel Lab., Aeronautical Systems Div., Lackland Air Force Base, Tex.
DEVELOPMENT OF SCREENING AND SELECTION TESTS FOR WOMEN,
by Jane McReynolds. Sep 61, 11p. incl. tables.
(Proj. 7717)
(ASD TN 61-54) Unclassified report

DESCRIPTORS: (*Aptitude tests, Design, Standards.) (*Military personnel, *Women, Selection, Classification.)

This report details the development and standardization of replacement forms of the Armed Forces Women's Selection Test and the Women's Enlistment Screening Test. Classification Test R-5, with extended time limits and a revised conversion table, was used as the reference test for standardization of both tests. In the standardization testing, a form of WEST was always administered first, but counterbalanced order of administration of AFWST and the reference test was used to stabilize practice effect. Intercorrelations indicate close relationships between these forms and earlier forms of AFWST and WEST and effective prediction of scores used by the Army and Air Force in classifying enlisted personnel. (Author)

AD-266 934 Div. 28
(TIPTB/MS) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
DEVELOPMENT OF THE OFFICER QUALIFICATION TEST.

FORMS 7 AND 8,
by Allen N. Smith, Isaiah Guttman and others.
Sep 61, 13p. incl. tables (Technical bulletin 61-14)

Unclassified report

DESCRIPTORS: (*Achievement tests, Officer personnel, Navy personnel, Design, Standardization, Selection.)

This study reports on the development, standardization, and validation of new forms of the Officer Qualification Test to replace the currently operational forms. (Author)

AD-266 979 Div. 28
(TIPTB/CW) OTS price $6.60

Naval Medical Research Lab., New London, Conn.
PREDICTION OF ADJUSTMENT TO THE ANTARCTIC.
Vol. 20, no. 1,
by Benjamin B. Weybrew, H. B. Molish, and Richard P. Youniss. 13 Apr 61, 61p. (Rept. no. 350)
(Proj. MR005.14-2100-3.05)

Unclassified report

DESCRIPTORS: (*Adjustment (Psychology), *Antarctic regions, Exposure, Attitudes, Personality tests, Psychometrics.)

Predictive validites of several psychometric tests and trait ratings by teams of psychologists and psychiatrists were examined with respect to criteria of adjustment to the Antarctic during the wintering-over period of 1957. Thirty-three subjective symptoms reported monthly together with three other attitudinal criteria were intercorrelated and factor analyzed. The total N was 109. Using factor scores computed for each of the five factors extracted from this matrix as adjustment criteria, it was found that men with the following characteristics had the greatest adjustment potential for the Antarctic conditions: high intelligence test scores, low interest in organized sports, rated high with respect to ability to communicate, low with respect to overt hostility, high with respect to ability to cope with aggression, to have less than a college education, to be single and over 25 years of age, and to have come from the southern section of the U. S. The methodological importance of the application of factor analytic techniques to repetitively collected subjective data is emphasized. (Author)

AD-267 043 Div. 28
(TIPTB/MS) OTS price $1.25

Aviation Psychology Lab., Ohio State U., Columbus.
LONG-TERM RETENTION OF LEARNED SKILLS: A REVIEW OF THE LITERATURE.
Rept. on Human Factors in the Design of Devices for Operator Training and Evaluation,
by James C. Naylor and George E. Briggs. Aug 61, 35p. 123 refs.
(Contract AF 33(616)7269, Proj. 1710)
(ASD TR 61-390) Unclassified report

DESCRIPTORS: (*Memory, *Learning, Motor reactions, Transfer of training, Training.) Bibliography.

The ability to retain a learned skill or habit over extended time periods is a problem which has, as yet, not been too thoroughly explored. Reviewing those articles which seem to relate either directly or peripherally to long-term retention of learned motor behavior indicates that the number of variables of possible importance is quite large, and that in general only limited research has been conducted with any one of these given variables. The variables appear to fall into four general classes: those dealing with the type of task, those concerned with learning parameters, those concerned with retention interval parameters, and those concerned with recall parameters. Research under each category is reviewed and commented on, and suggestions are made that certain variables (such as task organization and the scoring method used) should be considered as key variables in any research program dealing with the long-term retention of skills. (Author)

AD-267 055 Div. 28, 1
(TIPTB/MS) OTS price $1.75

Martin Co., Baltimore, Md.
THE DESIGN OF OPERATOR CONTROLS: A SELECTED BIBLIOGRAPHY.
Rept. on Flight Display and Flight Control Integration Program,
by Frederick A. Muckler. Mar 61, 62p. 372 refs.
(Contracts AF 33(616)7752 and AF 33(616)5472, Proj. 6190)
(WADD TN 60-277) Unclassified report

DESCRIPTORS: (*Bibliography, *Human engineering, Display systems, Design.) (*Control systems, Design.)

The purpose of this report is to present a bibliographic survey of research on critical variables in the design of operator controls. Major emphasis in selecting articles was placed on the problems of (1) types of manual operator controls, (2) selecting operator controls, (3) physical dimensions of operator controls, (4) inadvertent control operation and control coding, (5) environmental factors and personal equipment, and (6) layout of controls. Where pertinent, material has been added in the areas of (1) skilled operator movement characteristics and (2) display-control relationships. Of prime interest was the physical characteristics of operator controls. (Author)

AD-267 098 Div. 28, 5
(TIPTB/MS) OTS price $13.50

Institute for Psychological Research, Tufts U., Medford, Mass.
VIGILANCE, FATIGUE AND STRESS IN AIR SURVEILLANCE (SAGE).
Final rept.,
by Edward A. Wade, Leota L. Janke and others.
30 June 61, 187p., 260 refs.
(Contract AF 19(604)5503)
(ESD TR 61-26)

Unclassified report

DESCRIPTORS: (*Air raid warning systems, *Radar operators, Effectiveness.) (*Personnel, *Stress (Physiology), *Fatigue (Physiology), *Attention.) Bibliography.

Literature, bearing upon the performance of human monitors in air-surveillance systems is surveyed. Studies of vigilance visual search, monitoring, fatigue and stress are critically reviewed in terms of implications for long-term monitoring behavior. Sections treat display variables, signal variables procedural variables and operator variables. Studies of visual and systemic fatigue, are examined with studies of task-induced stress, environmental stress and personal

stresses encountered by the operator. The data are related to operator duties in the SAGE-system. Recommendations, based upon the review, are made for improving and assuring the continued efficiency of human watchkeepers. Suggestions are made for further research in this area. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-266 239 Div. 29, 16
(TIPTB/CW) OTS price $1.60

Army Medical Research and Nutrition Lab., Denver, Colo.
FIELD TEST OF A HIGH-CALORIE, HIGH-PROTEIN BEVERAGE POWDER FOR USE AS A RATION SUPPLEMENT AT FORWARD MEDICAL STATIONS,
by C. Frank Consolazio, Juan B. Torres and Marion E. McDowell. 18 Sep 61, 15p. incl. tables. (Rept. no. 263)
Unclassified report

DESCRIPTORS: (*Beverage powders, *Military rations, *Proteins, Acceptability, Containers, Packaging.)

The purpose of this study was to evaluate the acceptability of a high-calorie, high-protein food supplement designed for use at battalion aid stations, clearing stations and field hospitals under field conditions. The acceptability of the food supplement was evaluated on a total of 471 men (447 simulated and 24 actual casualties). Only 11 men or 2.5% expressed dislike for the product. The food supplement is highly recommended for use at battalion aid stations, clearing stations and field hospitals for casualties. Individual servings should be packed in polyethylene containers 3 - 5 ounces larger than the size in use. This, with the addition of a mark indicating the 8 ounce water level, would permit mixing without transferring to another container. The larger quantities should be packed in coffee type tins with key openers rather than the present type. The possibility of providing another flavor should also be considered, since a few men do not like the chocolate taste. (Author)

AD-266 312 Div. 29, 20, 16
(TIPTB/CW) OTS price $10.50

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
NUTRITION AND RADIATION INJURY: AN ANNOTATED BIBLIOGRAPHY,
by Doris Howes Calloway and Lore Rose David. July 61, 120p. 536 refs. (Library bull. no. 6)
Unclassified report

DESCRIPTORS: (*Bibliography, *Radiation injuries, Control, Therapy, *Radioprotective drugs, *Nutrition, *Diet, Feeding.) Laboratory animals.

The purpose of this bibliography is to bring together information on the relationships among diet, nutritional status, radiosensitivity, and radioprotection; and to suggest profitable areas for futurp research. Several excellent sources for review of the radiation syndrome have been listed in the first sections of this bibliography. A sampling of papers dealing with the various animal groups investigated have also been included. Discussions of metabolic behavior of each of these following exposure to irradiation are included in most of these. A few entries have been annotated where the observations are not cited in common texts and are pertinent to specific topics covered later, or to nutrition studies in general. References to tissue levels and excretory patterns are presented briefly under each nutrient category. Representative reviews on chemical protection, and some source material on the problems associated with the investigation of the product of fall-out have been given. Certain arbitrary decisions as to what constitutes a nutritional variable, had to be made. In the case of cystine, cysteine, and related thio-amines we have annotated those investigations in which the compounds were administered by mouth, where comparisons with other nutrients were made, or if the data were atypical. The many successful trials are shown by title only in the interest of conserving space. (Author)

AD-266 314 Div. 29
(TIPTB/CW) OTS price $3.90

Rutgers U., New Brunswick, N. J.
PREPARATION AND STORAGE STABILITY CHARACTERISTICS OF DEHYDRATED SAUSAGE PRODUCTS.
Rept. no. 7 (Final) 15 Mar 58-14 Sep 60,
by Roy E. Morse. 14 Sep 60, 1v. incl. tables.
(Contract DA 19-129-qm-1118)
Unclassified report

DESCRIPTORS: (*Meat, Freeze drying, Antioxidants, Condiments, Additives, Storage, Stability, Acceptability.) (Preparation, Dehydration.)

An experiment to test the effect of storage on the characteristics of freeze-dried sausages was run for the duration of seven months. Storage temperature, moisture content, salt level, antioxidant level as well as the length of storage period were factors tested. It was found that the lower storage temperature (40 F.) is beneficial for acceptability and retardation of rancidity. The beneficial effect of the lower moisture content however is not quite as evident. The salt contributes more to better acceptability than to rancidity retardation or development. A 0.02% of Tenox 6 (on fat content basis) plus 1% of Gentisic acid (on basis of total emulsion) had the same antioxidant properties as at a higher level. The storage period had an adverse effect on the acceptability and rancidity development, however, a salt freeze-dried frankfurter kept at 40 F. suffers no ill effects after six months storage period. (Author)

AD-266 339 Div. 29, 1
(TIPTB/CW) OTS price $ .50

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
RATIO AND DILUTION VALVES LOW PRESSURE OXYGEN.

Rept. on Oxygen Dispensing Assemblies,
by Henry Seeler. July 61, 8p. incl. illus.
(Proj. 6352)
(ASD TR 61-291) Unclassified report

DESCRIPTORS: (*Oxygen equipment, *Oxygen, *Pressure regulators, *Control valves, Pressure, Reduction for Oxygen masks and Pressure suits.)

Altitude controlled oxygen regulators designed for use with partial pressure suit helmets supply 100 percent oxygen at a fixed pressure above ambient pressure. This type of regulator could not be used with a standard pressure breathing oxygen mask. To negate the need for a dual oxygen regulator system, i.e., one for suit helmets and one for oxygen masks, a low pressure ratio valve was designed. The valve was later modified to permit oxygen delivered by the regulator to be diluted with ambient air. The modified valve provided the pressure reduction required for the mask and extended flight range by conserving oxygen. The valve can be fabricated as (1) a low pressure ratio valve, (2) a combination diluter and low pressure ratio valve, and (3) a diluter valve. (Author)

AD-266 554 Div. 29
(TIPTB/LH) OTS price $1.60

Marine Corps Equipment Board, Quantico, Va.
TEST OF UTILITY COAT, TROUSERS AND CAP.
Final rept.
20 Nov 61, 20p. incl. illus.
(Proj. 42-58-01F)
Unclassified report

DESCRIPTORS: (*Clothing, Materials, *Textiles, Cotton textiles, Nylon.) Military requirements, Tests.

This is a report of the results of test in the Fleet Marine Force of two different nylon-cotton blend utility uniforms, one in a sateen weave fabric and the other in a herringbone twill weave fabric, using the standard cotton-sateen utility uniform as the control item, to determine their suitability for Marine Corps use. The nylon-cotton blend uniform made in a 100% 15/1 cotton warp, 100% 200-34-680 three ply nylon filling in a sateen weave fabric is considered to be the most suitable of the three test uniforms for Marine use. The standard cotton-sateen uniform is considered unsuitable for Marine Corps use. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-266 100 Div. 30, 15
(TIPTP/JW) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY ON APPLICATION OF CODING THEORY.
Semi-annual rept. no. 2, 1 Dec 60-30 May 61, by A. E. Laemmel. 31 Aug 61, 23p. incl. illus. tables (Rept. no. PIBMRI-895.2-61)
(Contract DA 36-039-sc-78972, Proj. 3A99-20-001-07)
Unclassified report

DESCRIPTORS: (*Digital recording systems, Computers, *Coding, Combinatorial analysis.) (Algebras, Functions, *Matrix algebra, *Communication systems, Functional analysis.)

Several new results are obtained by using a code set algebra. The most important is a necessary and sufficient condition for the unique decomposability of a compound code, i.e., a code which cannot be described by a single finite code table. This is a matrix form for the well known algorithm of Sardinas and Patterson which applies to simple codes. (Author)

AD-266 113 Div. 30, 15
(TIPTE/CDM) OTS price $5.60

David Sarnoff Research Center, Princeton, N. J.
RELIABILITY OF TRIANGULAR SWITCHING NETWORKS WITH INTERMITTENT FAILURES,
by J. A. Brzozowski. 14 Aug 61, 47p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)8423)
(AFCRL 785) Unclassified report

DESCRIPTORS: (*Mathematical logic, *Computer logic, Functions, Special functions, Probability.) (*Electrical networks, *Switching circuits, Design, Reliability, Failure (Mechanics), Synthesis.)

A study was made of the problem of reliability of combinational switching networks constructed from logical gates which are subject to intermittent failures. Because of malfunctioning of components, a gate may realize any one of several Boolean functions and the probabilities of these functions are used to describe the behavior of the gate. In many cases, depending on the probability distribution, a more reliable gate can be obtained by using n + 1 identical n-input gates in a triangular structure (the outputs of n gates feeding the (n + 1) 'st). The gates so improved can be used again in a triangular structure. The properties of such recursions are investigated in detail for gates with probability distributions over unate functions and it is shown that arbitrary reliability can be achieved for the class of simple threshold gates, under suitable conditions. (Author)

AD-266 114 Div. 30, 15, 8
(TIPTE/CDM) OTS price $2.60

David Sarnoff Research Center, Princeton, N. J.
TRIANGULAR RECTIFIER NETWORKS,
by Saul Levy. 23 Aug 61, 28p. incl. illus. (Scientific rept. no. 3)
(Contract AF 19(604)8423)
(AFCRL 786) Unclassified report

DESCRIPTORS: (*Mathematical logic, Probability, Computer logic, Mathematical analysis.) (*Rectifiers, *Diodes, Reliability.) (Electrical networks, Switching circuits, Electron tubes.)

A study was made of the problem of improving the reliability of rectifier gates subject to intermittent failures. A systematic technique for introducing redundancy is described and it is shown that this technique will, if applied properly, result in more reliable networks. The advantages and the limitations of this technique are discussed in detail. (Author)

AD-266 186 Div. 30
(TIPTW/JRG) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
THE DAVID TAYLOR MODEL BASIN 7- BY 10-FOOT TRANSONIC WIND TUNNEL FACILITY,
by Walter S. Thomas. July 60, 35p. incl. illus. (Aero rept. no. 985)
Unclassified report

DESCRIPTORS: (*Transonic wind tunnels, *Test facilities, Determination, Aerodynamic data, Damping, Flight paths.) (Wind tunnel models, Design, Mounting brackets.)

A description is given of the David Taylor Model Basin 7- by 10-ft transonic wind tunnel. Information is given which should aid in preliminary model design. Emphasis is placed on the versatility of 2 model support systems which may be used simultaneously to provide rapid studies of trajectories and various downstream surveys. (Author)

AD-266 205 Div. 30, 8
(TIPTM/GEC) OTS price $1.60

Vermont U., Burlington.
A PORTABLE ELECTRONIC MOISTURE DETECTOR FOR REINFORCED PLASTICS,
by G. A. Gagne and J. O. Outwater. 15 Oct 61, 11p. incl. illus. (Technical memo. no. 172)
(Contract Nonr-321901, Proj. NRL 62 R05 19A)
Unclassified report

DESCRIPTORS: (*Plastics, Epoxy resins, Glass textiles, Laminates, *Moisture, Absorption, Mechanical properties, *Electronic equipment.) Test equipment, Nondestructive testing.

A new portable instrument is described which is capable of detecting moisture in small concentrations in fiberglas reinforced plastics. Resonant circuits in a balanced bridge network determine empirically the change in permittivity and dissipation factor of the material. A stable crystal-controlled oscillator powers the bridge and measurement consists of placing a probe against the material, readjusting the bridge and noting the imbalance. (Author)

AD-266 216 Div. 30
(TIPTB/MS) OTS price $9.60

Washington U., Seattle.
SUPPLEMENT TO THE IBM TYPE 650 PROGRAM LIBRARY REPORT,
by Calvin E. Wright, Paul Horst and others. Aug 61, 120p.
(Contract Nonr-47708; Public Health Research Grant M-743(C6)
Unclassified report

DESCRIPTORS: (*Computers, *Programming, Documentation, Punched card methods.) Mathematical analysis, Applied psychology.

AD-266 251 Div. 30, 17
(TIPTM/BRW) OTS price $.50

Materials Central, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A LABORATORY ARC MELTING FURNACE FOR THE PRODUCTION OF ALLOY SAMPLES FROM REACTIVE METALS.
Rept. for Feb 60-Feb 61 on Applied Research in Electrical, Electronic, and Magnetic Materials, by John C. Olson. May 61, 12p. incl. illus.
(Proj. 7371)
(ASD TN 61-32) Unclassified report

DESCRIPTORS: (Metallurgy, Electric arcs, *Laboratory furnaces, Controlled atmosphere, Design, Operation.) (Alloys, Intermetallic compounds, Melting, Preparation.) (Rare earth elements, Metals, Phase studies.) (Magnetic materials, Nickel alloys, Copper alloys, Thermometers.)

An arc melting furnace for the production of small samples of alloys and intermetallic compounds has been designed and built. It is used in phase diagram investigations involving reactive materials such as rare earth metals. It was also used for the laboratory scale preparation of nickel-copper alloys being studied for magnetic thermometry. The design, capabilities and operation of the furnace are described. (Author)

AD-266 256 Div. 30, 2
(TIPTP/MFA) OTS price $1.10

Bell Telephone Labs., Inc., Whippany, N. J.
PROJECT VELA UNIFORM.
Quarterly rept. no. 2, 1 June-31 Aug 61, by W. E. Danielson. 31 Aug 61, 5p.
(Contract NObsr-85206)
(ARPA Order no. 192-61) Unclassified report

DESCRIPTORS: (Research program administration, Earthquakes, Instrumentation, *Operations research.) (Earthquakes, Nuclear explosions, *Seismic waves.) (Analysis, Magnetic tape, Radiofrequency spectrum analyzers, Terrestrial magnetism.)

Instrumentation of a seismic research facility is described and preliminary efforts at interpreting spectrograms to assess their value in distinguishing manmade from natural seismic phenomena are presented. During this period, construction of a seismometer vault was started, a breadboard spectrum analysis and writeout equipment was completed, and a collection of taped seismic events was readied for analysis and interpretation. (Author)

AD-266 310 Div. 30, 6
(TIPTP/MFA) OTS price $3.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
DIGITAL CALCULATION OF E.M. DIFFRACTION FROM APERTURE BLOCKING.
Rept. on Study of Electromagnetic Window Dielectric Techniques, by J. Robert Collier. 15 Sep 61, 34p. incl. illus. (Rept. no. 1180-5)
(Contract AF 33(616)7614)
Unclassified report

DESCRIPTORS: (*Radar antennas, Design, *Diffraction, Measurement, Electromagnetic fields, Electric currents, Magnetic effects, Radar confusion reflectors, Detection.) (*Digital computers, Programming, Sampling.) (Numerical analysis, Equations.) Dielectrics.

The theory for obtaining the far field pattern of an antenna confronted by a two dimensional obstacle is developed and the expressions are then transformed into a form adaptable for programming on a digital computer. Several computed far field patterns are compared with experimental results. A description and details of the computer program are included. (Author)

AD-266 311 Div. 30
(TIPTP/MFA) OTS price $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE WKB SOLUTION FOR TRANSMISSION THROUGH INHOMOGENEOUS PLANE LAYERS.
Rept. of Study of Electromagnetic Window Dielectric Techniques, by Jack Richmond. 15 Sep 61, 15p. incl. illus.
(Rept. no. 1180-6)
(Contract AF 33(616)7614)
Unclassified report

DESCRIPTORS: (Radomes, Sandwich construction, *Electromagnetic waves, *Wave transmission, Dielectrics, Sheets, *Polarization, Electric fields.) (Equations, Differential equations.)

The WKB (Wentzel, Kramers, Brillouin) asymptotic solution is developed for the field distribution and the transmission coefficient of inhomogeneous plane layers. Expressions are presented for lossy and lossless layers for parallel and perpendicular polarization. These WKB formulas are considerably more convenient for numerical calculations than the exact solution (where available) or step-by-step numerical integration. They provide accurate results if the permittivity gradient is saml1 in comparison with the permittivity itself, and yield the exact solution for a homogeneous layer. Graphs are included to show the excellent agreement between the WKB solution and the exact solution. If large permittivity gradients are avoided, the WKB formulas show that the transmission coefficient of an inhomogeneous layer is determined by its initial, final and average values. Any number of different permittivity distributions may be used to realize a given set of initial, final and average values, but the transmission coefficient is the same for each one. (Author)

AD-266 317 Div. 30, 25
(TIPTW/RD) OTS price $7.60

Randolph-Macon Coll., Ashland, Va.
THE PNEUMATIC ENERGY DETECTOR WITH REMOTE OPTICS (PEDRO).
Quarterly progress rept. no. 1, 22 June-30 Sep 61, by Richard E. Grove, Marvin L. Luther and others. 15 Oct 61, 71p. incl. illus. table (Rept. no. 5)
(Contract N178-7904)
Unclassified report

DESCRIPTORS: (*Electromagnetic fields, *Hazards.) (*Optical instruments, *Detectors, *Thermal radiation.) (Electric detonators, Electric igniters, Thermal radiation, Measurement.) (Diaphragms (Mechanics), Tests, Test equipment, Materials, Pneumatic devices.) (Glass textiles, Optics.)

A new instrument is described to measure, for hazards evaluations, the thermal energy produced in the bridgewire of an electroexplosive device by the reception of radiated electromagnetic

energy. The device, the pneumatic energy detector with remote optics (PEDRO), employs fiber optics techniques to sense by a schlieren method the deformation of an elastic mirrored diaphragm that is distended by the expansion of a small volume of gas heated by the thermal output of the excited bridgewire. Electrical coupling between the instrumentation and the weapon under test is minimized by conveying the information output from the simulated electroexplosive device to the photodetector and recorder as an intensity modulated light signal through a dielectric light pipe composed of a bundle of optical fibers. Initial efforts in a feasibility study of this device are reported. Included are discussions of optical, thermal, and mechanical design criteria. Experimental work on fabrication and evaluation of the mirrored diaphragms is reported. (Author)

AD-266 342 Div. 30, 1
(TIPTW/RD) OTS price $2.00

Bolt, Beranek, and Newman, Cambridge, Mass.
WIDE BAND SOUND SOURCE FOR WADD SONIC FACILITY.
Summary analysis rept. Mar 59-Jan 61 on Dynamic Problems of Flight Vehicles.
1 Sep 60, 66p. incl. illus.
(Contract AF 33(616)5274)
(WADD TR 61-109) Unclassified report

DESCRIPTORS: (*Sound generators, Acoustics, Broadband, Design, Noise generators.) (Test facilities, Acoustics, Noise generators.) (Aircraft, Satellite vehicles, Structures, Tests.) (Noise, Sound, Mathematical analysis.)

The following were concluded regarding a wide band sound source: (a) The gas-fuel powered wide band acoustic generator is feasible and probably practical in the 100 kw (net) power range. There is no apparent reason why much higher power ratings could not be considered; (b) The optimum acoustic efficiency is obtained with tandem-type devices operating at high inlet charge density, low fuel energy, low compression ratio so as to avoid excessive exhaust temperatures. The air-spring device is much less efficient but can use high-energy fuels and high compression ratios; (c) The exhaust temperatures can be lowered by injection of secondary air at low (close-to-atmospheric) pressure; and (d) The discussion was based on acetylene but butane or coke-gas or methane would probably be satisfactory. There appears to be no advantage in the use of hydrogen which was disqualified because of its detonation characteristics. (Author)

AD-266 384 Div. 30, 32
(TIPTB/WS) OTS price $16.50

Milan U. (Italy).
LINGUISTIC ANALYSIS AND PROGRAMMING FOR MECHANICAL TRANSLATION (MECHANICAL TRANSLATION AND THOUGHT),
by Silvio Ceccato, Enrico Maretti and others.
4 June 60, 242p. incl. illus. tables.
(Contract AF 61(052)212, Proj. 76-4599 FY 59)
(RADC TR 60-18) Unclassified report

DESCRIPTORS: (*Machine translation, Language, Coding, Programming.)

The research carried out concerns linguistic analysis, codification, and programming with a view to mechanical translation of any text whatever from one language into another. The translating procedure consists in a double conversion; from the input language into the characteristic correlational structures of thought, and from these structures into the output language; the procedure comprises such modifications as are required by the differences in the thinking of different language groups or peoples. This approach has, so far, been applied to Russian input and English output (approximately 15,000 matrices). The procedure and the partial tests were planned for an IBM 650 computer. (Author)

AD-266 417 Div. 30, 12
(TIPTW/RD) OTS price $9.60

Communications Research Labs., Santa Ana, Calif.
ACCURACY AND IMPROVEMENT STUDY FOR TRACK VELOCITY MEASUREMENT FOR AFMDC.
Final rept.,
by A. J. Mallinckrodt and F. M. Gardner. Sep 61, 118p. incl. illus. tables, 14 refs.
(Contract AF 29(600)2531)
(AFMDC-TR-61-28) Unclassified report

DESCRIPTORS: (*Rocket propelled sleds, *Velocity, Measurement, Errors.) (Test facilities, Instrumentation, Tracks (Aerodynamics).) (Data processing systems, Errors, Reduction.) (Statistical sampling, Data, Velocity, Fourier analysis.) (Test methods with Analog to digital converters with Accelerometers.)

Completed research is presented on improved precision velocity measuring systems for the AFMDC track. The general objectives of this study are summarized. The various sources of error of the present velocity measuring system are enumerated and explained. The largest errors are differential motion between the center of gravity of the guidance system and the space-time head and loss of high frequencies. Two approaches are suggested for reduction of differential motion error: (1) reduce the actual motion or (2) measure the motion and apply it as a correction to the corrupted data. Filter error may be reduced to the vanishing point by adding an accelerometer to form a hybrid system. Theoretical error analyses in the frequency domain are carried out for the space-time system and for the accelerometers-space-time hybrid system including alias or sampling error effects. A generalized three-element hybrid system has been analysed and optimized for continuous data. (Author)

AD-266 446 Div. 30, 6
(TIPTE/RD) OTS price $6.60

Aerospace Corp., Patrick Air Force Base, Fla.
EVALUATION OF MISTRAM ACCURACIES THROUGH REGRESSION ANALYSIS,
by Norman Bush. 11 Oct 61, 69p. incl. illus., 12 refs. (Rept. no. TDR-930(A2122)TN-2)
(Contract AF 04(647)930) Unclassified report

DESCRIPTORS: (*Test facilities, Atlantic Ocean, *Instrumentation.) (*Radar equipment, *Interferometers, Radar stations.) (Experimental data, Statistical analysis.) (Ballistic cameras, Airborne, Radio equipment, *Tracking, *Radio scanning.)

The use of univariate and multivariate regression procedures is described with respect to evaluating the MISTRAM position and velocity accuracies and biases. Data are collected by means

of airborne and missile tests from MISTRAM, Ballistic Cameras, G. E. MOD III, and AZUSA Mark II. The data to be analyzed consist of differences between MISTRAM and various instrumentation systems. The ultimate goals of the regression analysis are to satisfy the test objectives set up by the Air Force and to obtain a maximum amount of information concerning the accuracies and biases of the MISTRAM system. An illustrative example in both the univariate and multivariate regression setup is given, as well as a workable FORTRAN program for the univariate case. Although this report is devoted primarily to the application of regression techniques for evaluating the MISTRAM accuracies, it should be noted that the prescribed regression procedures are perfectly general and could also be used for evaluating many types of instrumentation systems. (Author)

AD-266 423 Div. 30
(TIPTB/LH) OTS price $12.00

Autonetics, Downey, Calif.
AN ANNOTATED BIBLIOGRAPHY ON THE RELIABILITY OF ELECTRONIC COMPUTERS,
by Marnelle Kinney and Ilene M. Miller.
30 Oct 61, 157p. (Rept. no. EM-7336)
Unclassified report

DESCRIPTORS: (*Bibliography, *Computers, Digital computers, Analog computer, *Reliability.)

This bibliography of 332 annotated references on computer reliability covers the period from 1946 to 1961. It should be used in conjunction with Autonetics EM-7335, A Survey of the Literature on Reliability, since much of the data included there is also applicable to computers. The references are arranged according to year, and alphabetically by title, with an author and a subject index. (Author)

AD-266 448 Div. 30, 6, 8,
(TIPTN/RD) OTS price $10.10

Electro-Optical Systems, Inc., Pasadena, Calif.
VELOCITY MEASURING SYSTEM EMPLOYING MODULATED LIGHT DOPPLER TECHNIQUES,
by Ronald A. Emerling. June 61, 127p. incl. illus. 10 refs.
(Contract AF 29(600)2527)
(AFMDC-TR-61-16) Unclassified report

DESCRIPTORS: (*Rocket-propelled sleds, *Velocity, Measurement.) (Test methods, Doppler systems, Broadband, Light Pulses, Photoelectric shutters, Electronic systems, Optical systems.) (Light pulses, Modulation.) (Test facilities, Instrumentation.)

A high accuracy, wide band velocity measuring system is described employing modulated light Doppler techniques. The system measures the sled velocity at the Holloman Track. A Kerr cell operating on the 4th harmonic of a 7.5 mc modulating voltage is employed as a light modulator. The Doppler information is carried on the 30 mc modulation; a process of frequency multiplication of the received signal allows the velocity averaging distance to be reduced from one-half wavelength (5 meters) to 5 cm. After data reduction the system is capable of measuring the velocity of the sled to 1 part in 100,000 with a 50 c bandwidth. This accuracy is maintained for all sled velocities from 10 meters per second to above 5000 feet per second. A reduction in bandwidth to 25 c allows this range of measurements to be extended down to 2.5 meters per second. (Author)

AD-266 577 Div. 30
(TIPTP/JDP) OTS price $13.00

Magnavox Research Labs., Torrance, Calif.
MATHEMATICAL MODELS FOR INFORMATION SYSTEMS DESIGN AND A CALCULUS OF OPERATIONS.
Final rept.
27 Oct 61, 178p. incl. illus. tables (MRL Rept. no. R-451)
(Contract AF 30(602)2111, Proj. 4594)
(RADC TR 61-196) Unclassified report

DESCRIPTORS: (*Data processing systems, Design, Numerical methods and procedures, *Operational calculus, Algebra.)

A general measure of component efficiency was investigated and applied to several types of information system components. Utilizing this measure of component efficiency, a model based on linear algebra was developed for a total information system. This model includes a generalized measure for total system efficiency. The application of the model was illustrated on a set of typical information storage, file organization, and equipment design problems. A calculus of operations, based on the measure of total system efficiency, was developed with broad application at all levels of system complexity. (Author)

AD-266 585 Div. 30, 2,
(TIPTB/CCH) OTS price $6.60

National Bureau of Standards, Boulder, Colo.
MUF-FOT PREDICTIONS BY ELECTRONIC COMPUTERS,
by Donald L. Lucas and George W. Haydon.
14 Aug 61, 62p. incl. illus. tables (NBS Rept. no. 6789)
(NBS Proj. no. 8500-20-85504)
Unclassified report

DESCRIPTORS: (Mathematical computer data of Ionosphere, *Mapping by Numerical methods and procedures, Electronic systems, *Computer logic.)

Ionospheric mapping by numerical coefficients as recently developed at the Central Radio Propagation Laboratory may form the basis of improved ionospheric predictions. The most efficient use of ionospheric predictions in the numerical coefficient format requires a high speed computer. An electronic computer program to calculate maximum usable frequencies and optimum traffic frequencies on the basis of numerical coefficients is described. A tentative prediction method based on 1954 and 1958 coefficients as being typical of solar activity extremes is proposed. Sample checks between the numerical coefficient method, other prediction methods and observations, are shown. (Author)

AD-266 610 Div. 30, 25
(TIPTP/MFA) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
AN ELASTIC-PLASTIC ANALYSIS OF A CYLINDRICAL SHELL WITH PARTIALLY PLASTIC CROSS SECTIONS,
by Bernard W. Shaffer and Martin Senator.
Aug 61, 22p. illus. table.
(Subcontract to Allegany Ballistics Lab., Hercules Powder Co., Cumberland, Md., Contract NOrd-16640)
Unclassified report

DESCRIPTORS: (*Structural shells, Sandwich construction, *Elasticity, Plasticity, Load distribution, Deformation, Stresses, Mathematical analysis, Shear stresses, Linear systems.) (Experimental data, Equations, Tables.)

Division 30-RESEARCH AND RESEARCH EQUIPMENT

AD-266 674 Div. 30, 31
(TIPTE/NTM) OTS price $1.60

David Taylor Model Basin, Washington, D. C.
MODEL TEST OF A PROPOSED AGMR ANTIROLL TANK,
by Joseph E. Russ. Oct 61, 13p. incl. illus.
(Rept. no. 1577)
Unclassified report

DESCRIPTORS: (*Tanks, Model basins, Design, Model tests, Tests, Test equipment, Ships, Stabilization, Roll, Motion.)

A 1/22-scale model of a passive antiroll tank, proposed for installation on the AGMR, was oscillated in roll at amplitudes of 1, 2, and 3 degrees for a tank water level corresponding to the design value of 4 ft and at 2 degrees of roll amplitude for tank water levels 1 ft above and 1 ft below the design level. Measurements were made of the moment developed by the tank. Curves showing the variation of tank moment, phase angle, and tank fluid angle with roll frequency are presented. (Author)

AD-266 725 Div. 30, 4
(TIPTM/TCG) OTS price $1.50

Directorate of Materials and Processes, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
ANALYSIS AND DESIGN OF AN ELECTRON GUN-MOLECULAR BEAM INSTRUMENT FOR USE IN FREE RADICAL STUDIES.
Rept. for Dec 59-Aug 60 on The Chemistry and Physics of Materials,
by Michael P. Charles. June 61, 43p. incl. illus. table, 21 refs.
(Proj. 7360)
(WADD TN 60-251)
Unclassified report

DESCRIPTORS: (*Laboratory equipment, *Electron guns, Radiation effects on Molecular beams, Analysis, Design, *Free radicals, Excitation, Production in Helium, Controlled atmospheres, Low temperature research.) (Infrared spectrophotometers, Electrons, Paramagnetic resonance.) Vacuum systems.

An instrument was built for use in studying primary and intermediate effects of radiation upon different materials. It is an electron gun-molecular beam device to form a molecular beam with a long mean free path length from a known gas. The molecular beam is irradiated by the electron gun, producing excited states, ions, and free radicals. Due to the length of time from irradiation to being collected on a 4.2 K cold finger the excited states and ions return to their normal state, leaving the free radicals for study at different temperatures from 4.2 K to room temperature with infrared and electron paramagnetic resonance techniques. This method should produce an accurate, reliable history of radiation effect processes which a material will undergo after initial irradiation. (Author)

AD-266 728 Div. 30
(TIPTE/RD) OTS price $3.60

Directorate of Engineering Test, Aeronautical Systems Div., Wright-Patterson Air Force Base, Ohio.
THE HIGH TEMPERATURE HYPERSONIC GASDYNAMICS FACILITY.
Rept. for period ending Feb 61 on Experimental Simulation of Flight Mechanics,
by Robert W. Milling. Sep 61, 32p. incl. illus. tables.
(Proj. no. 1426)
(ASD TN 61-107) Unclassified report

DESCRIPTORS: (*Test facilities, *Hypersonic wind tunnels, Design, Heating, Instrumentation.) (Hypersonic flow, Simulation, Hypersonics.) (Heaters, Refractory materials, Oxides, Dioxides, Zirconium compounds, Aluminum compounds.)

A high temperature hypersonic gasdynamics facility is described. It was developed from efforts to extend the state of the art in hypersonic aerodynamic simulation. The high temperature facility is an operational hypersonic wind tunnel supplied by high pressure, heated air from a zirconia dioxide pebble heater. The maximum stagnation pressure and temperature is 40 atmospheres and 4500 F respectively. This facility is one of four of its kind in this hemisphere, and the only Air Force facility of its type. This report describes the first six months operation to include some design and development aspects. The successful operation of this facility is a significant achievement in the area of hypersonic aerodynamic testing techniques. (Author)

AD-266 731 Div. 30, 8
(TIPTE/CRJ) OTS price $9.10

Philco Corp., Blue Bell, Pa.
DESIGN AND DEVELOPMENT OF ANALOG-TO-DIGITAL CONVERTERS.
Final technical rept., 15 June 59-15 July 61 on Applied Communication Research for Air Force Vehicles,
by Robert V. Cotton, Eugene Goldberg, and Albert F. Tillman. Sep 61, 93p. incl. illus. 23 refs. (Research rept. no. 2237-F)
(Contract AF 33(616)6693, Proj. 4335)
(ASD TR 61-464) Unclassified report

DESCRIPTORS: (*Analog-to-digital converters, Radio signals, Coding, Analysis, Design.) (Electronic circuits, Airborne, Feedback, Coding.) (Electron tubes, Electron beams, Coding.) (Transistors, *Switching circuits.) (Guided missiles, Satellite vehicles, Circuits.)

A general study was made of simplified means of analog-to-digital conversion, with emphasis on high speed and high-precision encoding. Upon the completion of the study, 2 analog-to-digital converter systems were implemented in the form of feasibility models; one a high-speed system capable of encoding wideband signals to 3-bit precision at a 60 megabit rate in the frequency range from 0 to 10 mc; the other a 5-channel multiplex system capable of the simultaneous encoding of information to flexibility in analog-to-digital conversion systems, while the high-speed system represents the state of the art with regard to high speed in a fully implemented analog-to-digital conversion system. Both systems contain special instrumentation equipment in the form of decoders which perform a digital-to-analog conversion, allowing complete processing of digital information to study and evaluate effects of encoding. (Author)

AD-266 737 Div. 30, 12
(TIPTE/RD) OTS price $8.10

Allied Research Associates, Inc., Boston, Mass.
PRECISION VELOCITY MEASUREMENT FOR INERTIAL GUIDANCE TESTING,
by William D. Green, Jr., Thomas B. Smith, and Peter Felsenthal. June 61, 74p. incl. illus. 12 refs.
(Contract AF 29(600)2528, Proj. 6888)
(AFMDC TR 61-17) Unclassified report

DESCRIPTORS: (*Rocket propelled sleds, *Velocity, Measurement, Test methods.) (*Inertial guidance of Test facilities, Simulation, Acceleration of Tests.) (Test methods for Velocity, Doppler systems, Masers, Accelerometers, Data transmission systems.)

Two practical solutions are advanced to the problem of measuring the velocity of the center of gravity of a rocket sled to 1 part in 10 to the 5th power over a speed range of 200 to 5,000 ft/sec. Solutions are based on a combined space-time/accelerometer system. The characteristics of the systems and the manner in which they meet the requirements are discussed and a program is outlined whereby either system may be introduced as the standard velocity measuring system for the sled test facility at the Air Force Missile Development Center. In reaching the conclusion that the combined space-time/accelerometer system is the optimum solution, other methods were investigated. Results of these studies of direct physical methods, as well as methods from which velocity may be inferred, are discussed. None of the methods examined was found to offer a satisfactory solution to the problem at hand. It is pointed out that quality of instrumentation must be paramount in developing any velocity measuring system and no amount of statistical operations with the data can compensate for data of poor quality. (Author)

AD-266 739 Div. 30, 6
(TIPTW/DLW) OTS price $6.60

Aerospace Corp., Los Angeles, Calif.
MEASUREMENT OF REDUCED RADAR CROSS SECTIONS,
by R. C. Hansen, H. E. King, and C. G. Bachman. Oct 61, 60p. incl. illus. 36 refs. (Rept. no. TDR-930(2119)-TN-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Radar echo areas, *Test facilities, Radar targets, Radar reflections, Test methods, Test equipment, Measurement.) (Radar pulses, Radar equipment, Instrumentation, Frequency modulation, Moving target indicators, Electromagnetic wave reflections, Sensitivity, Tests.)

Problems of measuring low radar cross sections of objects which are physically large are investigated. The 3 salient problems are: (1) determining the required distance between antenna and target, (2) reducing the background scattering due to terrain effects, etc., and (3) providing a target support of negligible cross section. Five types of cross section ranges are described and evaluated. These are the indoor anechoic chamber, the radome-enclosed chamber, the conventional outdoor range, the ground plane outdoor range, and the oblique range in which the target is suspended at an oblique angle above ground. A short pulse radar and a target support using nylon ropes are also indicated. (Author)

AD-266 773 Div. 30
(TIPTB/LH) OTS price $1.10

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
TWO-POSITION CONDUCTING LIQUID LEVEL CONTROL,
by P. P. Kasperavichus. 2 Nov 61, 3p. incl. illus. (Trans. no. MCL-1418 from Byulleten' Isobreteniy 15, 1960)
Unclassified report

DESCRIPTORS: (*Translations, Technological intelligence, *Liquid level control, *USSR.)

AD-266 801 Div. 30, 6
(TIPTB/CCH) OTS price $4.60

Ordnance Tank-Automotive Command, Detroit, Mich.
THERMOGRAPHIC PROFILES OF MATERIAL DISCONTINUITIES,
by David K. Wilburn. 1 Mar 61, 37p. incl. illus. tables (Rept. no. RR-37)
(Proj. 2210.4500.061)
Unclassified report

DESCRIPTORS: (*Radiometers for Infrared scanning and Detection of Thermal radiation, Infrared pulses in Solids, Materials.) (Instrumentation, Measurement of *Thermal conductivity, Temperature, Sensitivity, Thermionic emission.) *Non-destructive testing.

An infrared line scan radiometer was utilized to obtain thermal patterns representative of interior discontinuities in solids of low heat conductivity. Temperature differences as low as 0.6 C could be detected with a theoretical resolution of 0.031 inches. Non-metals with thermal conductivity k, below 0.01 cal/sqcm/sec/degree C/sec can be examined by this method. Metals and non-metals with k values above 0.1 cal/sqcm/sec/degree C/sec dissipate surface thermal gradients too rapidly to produce a sufficient temperature difference for detection. The radiometer system is evaluated with respect to parameters of frame time, bandwidth and sample distance. Typical thermograms are presented for a variety of insulating and other low k value materials. (Author)

AD-266 860 Div. 30, 6
(TIPTE/CRJ) OTS price $2.60

Aircraft Armaments, Inc., Cockeysville, Md.
RADAR CHRONOGRAPH, M36.
Final rept.,
by Herman D. Raynes. Nov 61, 18p. incl. illus. 6 refs. (Rept. no. ER-2546)
(Contract DA 36-034-ORD-3236)
Unclassified report

DESCRIPTORS: (Design, Operation, Tests, Maintenance, Failure (Mechanics), *Radio doppler chronographs, *Radar equipment.) (Artillery fire, Projectiles, Velocity, Measurement, Test equipment.) (Electronic circuits, Radar transmitters, Radar receivers, Circuits.)

The Radar Chronograph Set, M36 is a continuous wave doppler radar transmitter-receiver system. Its function is the measurement of velocity of artillery projectiles ranging in size from 40 to 280 mm, and encompassing the velocity range from 250 to 6100 fps. The main objective was to develop an improved and updated version of T-7 Chronograph by reducing the size and weight, complexity of operation and maintenance, and susceptibility to failure under severe environmental conditions. This objective was accomplished. (Author)

AD-266 867 Div. 30, 17
(TIPTB/MS) OTS price $1.60

Engineering Supervision Co., New York.
INVESTIGATION OF STRESS DISTRIBUTION AND STRENGTH CHARACTERISTICS OF LOAD MAGNIFICATION ANVILS FOR

ULTRA HIGH PRESSURE APPARATUS.
Quarterly scientific rept. no. 3, 1 July-30 Sep 61.
30 Sep 61, 8p. incl. illus.
(Contract AF 19(604)7438)
(AFCRL-948) Unclassified report

DESCRIPTORS: (*Forge presses of Carbides, Tungsten compounds, Cobalt, Physical properties, Stresses, Tests, Design, Configuration.)

AD-266 879 Div. 30, 15
(TIPTB/CCH) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
SEQUENTIAL DECODING FOR BINARY CHANNELS WITH NOISE AND SYNCHRONIZATION ERRORS,
by R. G. Gallager. 27 Oct 61, 28p. (Rept. no. 256-2)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (Theory, *Coding, Sequential analysis, Mathematical analysis, Probability, Errors.)

Consider a channel for which the input is a sequence of binary digits and for which the output is the same sequence with each digit independently modified in the following way: with probability Pe, the digit is changed; with probability Pd, the digit is deleted from the sequence; and with probability Pi, the digit is replaced by two randomly chosen digits. The channel output gives no indication which digits were deleted or inserted. It is shown that convolutional coding and sequential decoding can be applied, with minor modifications, to this channel and bounds are derived on computation and error probability analogous to the bounds for the Binary Symmetric Channel. More precisely, a computational cut-off rate is defined. For code rates less than Rcomp bits per digit, the average decoding computation in the incorrect subset grows more slowly than linearly with the coding constraint length, and the probability of decoding error decreases exponentially with constraint length. For Pd=Pi=0, the above expression for Rcomp reduces to that derived by Wozencraft and Reiffen for the Binary Symmetric Channel. (Author)

AD-267 018 Div. 30, 8
(TIPTW/DLW) OTS price $8.10

ITT Federal Labs., Fort Wayne, Ind.
A STUDY FOR A VELOCITY MEASURING SYSTEM USING DOPPLER TECHNIQUES.
Final rept.,
by Edward W. Koenig. June 61, 84p. incl. illus. tables.
(Contract AF 29(600)2525)
(AFMDC-TR-61-19) Unclassified report

DESCRIPTORS: (*Rocket-propelled sleds, Tracks (Aerodynamics), *Velocity, Measurement, Doppler systems, Ground speed indicators, Electromagnetic wave reflections, Instrumentation, Test facilities, Effectiveness, Errors, Design, Tests.) (Electromagnetic waves, Propagation, Wave transmission, Analysis.)

An evaluation of a velocity measuring system using doppler radio techniques was completed. An estimate is given of the effects of atmospheric conditions on propagation of electromagnetic waves, track geometry and construction, reflection characteristics of the ground, track and objects in the vicinity, and track operating techniques. The results indicate that the system described is capable of measuring the velocity profile of the trajectory to an accuracy greater than 1 part in 100,000 being limited only by errors introduced by multipath transmission effects and readout frequency characteristics. Methods are given whereby these errors may be reduced. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-266 127 Div. 31, 14
(TIPTM/EJH) OTS price $4.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF DAMPING TREATMENTS FOR NEW CONSTRUCTION SUBMARINES.
Progress rept. no. 9,
by J. Oser. 1 Nov 61, 44p. incl. illus. tables.
(Rept. no. 94-33)
Unclassified report

DESCRIPTORS: (*Submarine noise, Vibration, Resonance, *Damping.) (Submarines, *Submarine bulkheads, *Submarine hulls, Vibration isolators, *Acoustic insulation, Insulating materials.) (Processing, High pressure research, Temperature.) (Steel, Coatings, Woolen textiles, Rubber, Test methods.)

Test treatments were applied to either one face, or to two faces of 1-3/4 inches thick steel bars, simulating in thickness bulkheads, and to 3/4 inch thick bars, simulating webs of deep frames. Each treatment consisted of a 1/8 inch thick constrained strip of wool felt, and a constraining Al bar. Damping of vibrations induced in the bars increased with constraining pressure, attaining a maximum at about 20 to 65 psi, after which damping declined. The beneficial effect of the initially applied pressure persisted after 103 days of stress relaxation. The best treatments were No. 178A for 3/4 inch thick steel bars, and No. 170 for 1-3/4 inch bars. Their average dampings at 85 F were 15% and 9% of critical, respectively, over the frequency range up to 2100 cps. (Author)

AD-266 195 Div. 31, 25
(TIPTW/JRG) OTS price $5.60

David Taylor Model Basin, Washington, D. C.
AXISYMMETRIC ELASTIC DEFORMATIONS AND STRESSES IN A RING-STIFFENED, PERFECTLY CIRCULAR CYLINDRICAL SHELL UNDER EXTERNAL HYDROSTATIC PRESSURE,
by John G. Pulos and Vito L. Salerno. Sep 61, 58p. incl. illus. 17 refs. (Rept. no. 1497)
(In cooperation with Brooklyn Polytechnic Institute, Contract N6onr-26303)
Unclassified report

DESCRIPTORS: (*Cylindrical bodies, Hydrostatic pressure, *Deformation, *Stresses, Mathematical analysis, Theory.) (Pressure vessels, Design.) (Submarine hulls, Design.)

This investigation of the axisymmetric elastic deformations and stresses in a ring-stiffened circular cylindrical shell under hydrostatic pressure was undertaken to account for the effect of the axial load and the load boundary condition of Viterbo at the rings. Neither of the previous solutions to this problem, notably those of Von Sanden and Gunther and of Viterbo, considered the nonlinear beam-column effect produced by the combination of longitudinal compression with longitudinal bending. Numerical calculations show that this nonlinearity can become significant and a graphical presentation of the refined analysis included herein clearly indicates its importance in certain ranges of the geometric parameters of interest to pressure-vessel designers. (Author)

AD-266 496 Div. 31, 9
(TIPTW/RD) OTS price $5.60

Institute of Engineering Research, U. of Calif., Berkeley.
SHIPS OF MINIMUM WAVE RESISTANCE,
by J. V. Wehausen, G. Reichert, and J. R. Gauthey. Oct 61, 55p. incl. tables (Series no. 82, Issue no. 21)
(Contract Nonr-22230)

Unclassified report

DESCRIPTORS: (*Ships, Design, *Hydrodynamics.) (Water waves, Resistance, Boundary layer, Separation.) (Ship hulls, Resistance, Mathematical analysis, Taylor's series, Integrals, Numerical analysis.)

It is conjectured that a practical means of obtaining a ship of minimum wave resistance which allows for boundary-layer separation, propeller-hull interaction and form resistance is to adopt a proven afterbody, say a Taylor's Standard Series form, and to calculate the corresponding optimum forebody from Michell's integral. By assuming an affinely related forebody, the minimization of Michell's integral is reduced to finding the minimum of a function of several variables. Certain integrals which occur as coefficients are evaluated on an IBM 704 digital computer. The computer program and its accuracy are briefly described. Optimum forebodies for various values of the Froude number and other parameters are discussed. (Author)

AD-266 627 Div. 31, 14
(TIPTW/JRG) OTS price $5.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF DAMPING TREATMENTS FOR DESTROYER HULLS.
Progress rept. no. 6,
by R. R. James. 9 Nov 61, 54p. incl. illus.
(Rept. no. 94-31)
(Proj. S-F013-13-01)

Unclassified report

DESCRIPTORS: (*Noise, Vibration, *Damping on *Destroyers on Naval vessels on Reduction of Ship noise and Shipborne, Sonar equipment, Interference.) (Noise, Vibration, Damping by *Coatings of Synthetic rubber, Nitrile rubber and Plastic coatings, Amides, Epoxy resins on *Ship hulls, Specifications, Tests.)

This investigation is being conducted to develop a damping treatment for destroyer hulls which will reduce the interference of the ship's noise with the ship's sonar. Tests are described which are considered suitable for incorporation in a performance specification for treatments intended to dampen over the frequency range: 2000 to 11,000 cps. The properties of a nitrile rubber damping treatment (I) and a plastic damping treatment (II) were measured by these test procedures. Specification limits based on the performance of the 2 damping treatments are proposed. It is shown that I provides better damping than II particularly after aging. The properties and damping efficiency of another nitrile rubber treatment are also described. (Author)

AD-266 649 Div. 31, 30
(TIPTE/NTM) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF DAMPING TREATMENTS FOR DESTROYER HULLS.
Progress rept. no. 7,
by R. R. James. 14 Nov 61, 7p. illus. 10 refs.
(Rept. no. 94-34)
(Proj. S-F013-13-01)

Unclassified report

DESCRIPTORS: (Damping, Effectiveness, *Destroyers, *Ship hulls, Submarines.) (Materials, Graphite, Copolymerization, Heat resistant polymers, Anhydrides, Acetates, Vinyl radicals, Resins, Plasticizers, Test methods, Tests.)

Research is presented in connection with the development of damping treatments (identified as F57) for surface ships. F57 is a graphite filled copolymer of vinyl acetate with maleic anhydride. It is flammable and thermoplastic. It is concluded that treatments similar to F57 should be prepared to see whether a non-flammable, better processing treatment having equal or better damping than F57 can be developed. (Author)

AD-266 971 Div. 31
(TIPTE/NTM) OTS price $2.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
BYRON-JACKSON CO. ELECTROMERSIBLE CIRCULATING PUMP FOR 1200 PSIG FORCED CIRCULATION BOILERS,
by J. Isinger. 6 Nov 61, 7p. illus. (Evaluation rept. no. B-332; NSM 640-001)

Unclassified report

DESCRIPTORS: (*Centrifugal pumps, *Boilers, Marine engines, Design, Tests.) (Pumps, Boilers, Feed water, Thermocouples, Test methods.) (Destroyers, Propulsion.) (*Centrifugal pumps, *Electric motors, Underwater, Operation.)

An electromersible (submerged motor) vertical centrifugal pump, designed as a circulating pump for 1275 psi forced circulation boiler service, was evaluated to determine its suitability. While the unit was 7% deficient in capacity, its over-all performance was excellent, with no significant wear or damage present after 2000 hours service at rated capacity under designed pressure and temperature conditions. The design was found satisfactory for use in future forced circulation boiler installations for Naval service, or in similar high pressure- high temperature applications. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-266 169 Div. 32, 30
(TIPTE/RD) OTS price $15.50

Stanford Research Inst., Menlo Park, Calif.
MULTIPLE INSTANTANEOUS RESPONSE FILE.
Final rept.,
by J. Goldberg, N. Green and others. Aug 61, 220p. incl. illus. tables, 22 refs.
(Contract AF 30(602)2142)
(RADC TR 61-233) Unclassified report

DESCRIPTORS: (*Documentation, Automation.) (Data, Indexes, Coding, *Data processing systems, *Data storage systems, Computer logic, Punched card methods, Memory devices, Switching circuits, Computers, Digital systems.)

A study was made of the feasibility of constructing a data retrieval file of large capacity in which all the data are interrogated simultaneously, with the possibility that any number of the file items may respond. The subject was named MIRF (Multiple Instantaneous Response File). The speed of such a file would ease the task of finding appropriate terms and the optimum specificity level for an interrogation, and would enable a user to make chains of association among search terms. Other possible applications are discussed. Several physical realizations suitable for an index file are considered. The most promising employs an arrangement of conductors, diodes, and magnetic cores, specially shaped to facilitate file construction and change. Codes and searching techniques suitable for such a file are discussed. An exact analysis was made of the simple model of a single-field superimposed code file previously analyzed in the literature, and numerical results were obtained using an electronic computer. A simple and efficient testing algorithm was devised for distinguishing between simultaneously responding items. The algorithm requires only a single presence/absence file output indication, thus permitting great simplification in file construction. (Author)

AD-266 912 Div. 32, 30
(TIPTB/MS) OTS price $15.00

Wayne State U., Detroit, Mich.
RESEARCH IN MACHINE TRANSLATION. RUSSIAN-ENGLISH.
Annual rept. no. 3,
by H. H. Josselson. 31 Aug 61, 227p. incl. illus.
(Contract Nonr-256200)
Unclassified report

DESCRIPTORS: (*Machine translation, Coding, Programming, Language, USSR, Dictionaries.)

AD-267 052 Div. 32
(TIPTB/MS) OTS price $2.25

National Opinion Research Center, U. of Chicago, Ill.
COMMUNITY REACTIONS TO AIR FORCE NOISE. PART I. BASIC CONCEPTS AND PRELIMINARY METHODOLOGY.
Rept. for 1954-1955 on Human Response to Vibratory Energy,
by Paul N. Borsky. Mar 61, 91p. incl. illus. tables.
(Contract AF 33(616)2624, Proj. 7210)
(WADD TR 60-689, vol. 1)
Unclassified report

DESCRIPTORS: (*Sociology, *Public opinion, *Jet engine noise, Airplane engine noise, Jet plane noise.)

A comprehensive conceptual scheme to describe the annoyance and complaint processes involved in community reactions to jet aircraft noise and related operations was developed. This broad theoretical framework is based on a more detailed evaluation of a NACA study, a series of intensive personal interviews with New York City and Hanscom Air Force Base residents, and discussions with technical personnel concerned with acoustics, public relations, jet manufacturing, and flight operations. The theoretical scheme deals with broad aspects of the problem: the objective physical characteristics of jet stimuli and related residential disturbances, the intervening sociopsychological variables affecting individual perception, feelings of annoyance, the additional interacting factors modifying individual expression of such feelings, and the over-all community considerations determining the scope of community action. A standard personal interview questionnaire was developed and pretested for possible use in validating the conceptual scheme and in deriving precise statistical relationships among the many variables. (Author)

AD-267 057 Div. 32
(TIPTB/MS) OTS price $3.00

National Opinion Research Center, U. of Chicago, Ill.
COMMUNITY REACTIONS TO AIR FORCE NOISE.
PART II. DATA ON COMMUNITY STUDIES AND THEIR INTERPRETATION.
Rept. for 1956-1957 on Human Response to Vibratory Energy,
by Paul N. Borsky. Mar 61, 171p. incl. illus. tables.
(Contract AF 41(657)59, Proj. 7210)
(WADD TR 60-689, vol. 2) Unclassified report

DESCRIPTORS: (*Public opinion, *Sociology, *Jet engine noise, Airplane engine noise, Jet plane noise.)

To determine preliminary relationships between variations in acoustic situations and disturbance, annoyance, and complaint potentials, personal interviews were held with almost 2500 residents at different air bases. The detailed acoustic conditions at three bases were measured. From these studies, the instruments and procedures for assessing neighborhood reactions were fully developed, pretested, and validated. The data provided valuable findings and the development of prototype statistical models for estimating neighborhood disturbance, annoyance, and complaint readiness. Community reactions are directly related to the intensity noise levels. A person is more disturbed, annoyed, and ready to complain if he is fearful of crashes and feels the air base is less important to local welfare and is less considerate of neighborhood feelings. Greatly disturbed people are also less satisfied with general living conditions in their areas, are more sensitive to noise of cars and trucks, and have less experience with flying. Time by itself has been proved no automatic cure of the annoyance problem. People who have lived near air bases longer are even more bothered by the airplane noise. (Author)

33. TRANSPORTATION

AD-266 509 Div. 33
(TIPTM/GEC) OTS price $4.60

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SOIL STABILIZATION. INVESTIGATIONS OF PHOSPHORUS PENTOXIDE AS A SOIL-STABILIZING MATERIAL, by G. R. Kozan. Nov 60, 36p. incl. illus. tables (Technical rept. no. 3-455; rept. no. 4) (Proj. 8S70-05-001)

Unclassified report

DESCRIPTORS: (*Soils, Stabilization, *Phosphorous compounds, Oxides, Additives.) (Sodium compounds, Silicates, Fluorides.) (*Clays, Trafficability.)

Laboratory and field tests were made of a phosphoric acid anhydride (P205) that would utilize available water in the soil, convert to the acid, and proceed with a stabilizing reaction. Initial laboratory tests revealed that 5% P205 plus 0.5% sodium fluosilicate was capable of increasing the compressive strength of a lean clay soil (soil A) from 24 to 165 psi after 24-hr curing and to nearly 400 psi after 3-day curing. Laboratory tests conducted on a similar soil (soil B) concurrently being used to construct the field test section showed the same stabilizer system used in the initial laboratory tests to be relatively ineffective for soil B. Analysis of soil B revealed the presence of concretions of calcium carbonate, which were not present in soil A. Traffic tests showed that the stabilized soil B surface was unable to withstand the intended traffic without failure as defined by specific criteria established for stabilized-soil surfaces. (Author)

AD-266 750 Div. 33, 1
(TIPTW/DLW) OTS price $5.60

Federal Aviation Agency, Washington, D. C.
COMMERCIAL SUPERSONIC TRANSPORT AIRCRAFT REPORT. June 61, 48p. incl. tables.

Unclassified report

DESCRIPTORS: (*Transport planes, *Commercial planes, *Supersonic planes, Air transportation, Supersonic flight, Safety, Reliability, Costs, Economics, Production, Feasibility studies.) (Supersonic flow, Shock waves, Noise, Airframes, Jet propulsion, Air traffic control systems, Structural shells, Analysis.)

Coordinated views are presented of the three agencies which are concerned with U. S. development of a commercial supersonic transport aircraft. Information is also presented which was prepared by a joint working group summarizing the analyses of industry and government representatives on the subject. Considerable research and development effort is required to attain the levels of safety, reliability and economical performance required for a satisfactory commercial transport aircraft. The development and production of a commercial supersonic transport aircraft appears essential to continued U. S. leadership in commercial aviation and is of increasing importance to national prestige. Production of this aircraft will afford important economic benefits in its effect on general economic progress, employment and the balance of trade. (Author)

Division 33 - MISCELLANEOUS ARTS

33. MISCELLANEOUS

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

Descriptors marked with an asterisk are included in the subject index.

BIOLOGICAL SCIENCES

AD-259 512 repriced $2.50

Operations Research, Inc., Silver Spring, Md. WEIGHTLESSNESS. TRAINING REQUIREMENTS AND SOLUTIONS, by Barry G. King, Cephas T. Patch, and Paul G. Shinkman. Rept. on Contract N61339-560. 3 Mar 61, 111p. 41 refs. Technical rept. NAVTRADEVCEN 560-1.

DESCRIPTORS: *Weightlessness, Physiology, Stress (Physiology), Training, Motor reactions, Space flight, Space medicine, Muscles.

Physical principles and biological mechanisms relevant to human performance under conditions of weightlessness have been explained in order that the trainee can develop an appreciation of how the unaccustomed environment will affect his behavior. Special emphasis has been given to (a) changes of man's center of mass as various parts of the body are moved with respect to each other, and the significance of CM of body movement, (b) the mechanisms of postural reflexes, including experimental observations of response of pigeons to postural disorientation by tilting during weightlessness, and (c) anticipated changes in the sensory input spectrum and implications of such changes. Models have been proposed as visual aids in providing for cognitive learning aspects of training. The different effects of weightlessness on motor-perceptual and perceptual factors have been identified and solutions proposed for separately training each of these effects. (Author)

Radiobiology

UCD-104 $2.50

California U., Davis. School of Veterinary Medicine. THE EFFECTS OF CONTINUAL Sr^{90} INGESTION DURING THE GROWTH PERIOD OF THE BEAGLE AND ITS RELATION TO Ra^{226} TOXICITY. Annual progress rept. no. 4 on Contract AT(11-1)-GEN-10. Sep 61, 126p.

UCD-102 $0.75

California U., Davis. School of Veterinary Medicine. EFFECTS OF X-IRRADIATION ON REPRODUCTION IN FEMALE BEAGLES. PART I: THE EFFECT OF TOTAL-BODY X-IRRADIATION ON THE ESTROUS CYCLE OF BEAGLES. PART II: REPRODUCTION IN X-IRRADIATED FEMALE BEAGLES TO 4 YEARS OF AGE. PART III: CONTINUAL REPRODUCTION OF X-IRRADIATED FEMALE BEAGLES. PART IV: REPRODUCTION AFTER NEUTRON EXPOSURE, by A. C. Andersen, F. Shultz, and T. J. Hage. Rept. on Contract AT(11-1)-GEN-10. Aug 61, 39p.

UCLA-482 $8.60

California U., Los Angeles. School of Medicine. SEMIANNUAL PROGRESS REPORT, for the period ending 30 June 61, on Contract AT(04-1)-GEN-12. 104p.

UCLA-483 $2.60

California U., Los Angeles. School of Medicine. STUDIES ON THE BEHAVIOR OF RADIOZINC IN RAT PLASMA, by J. P. Okunewick, B. Pond, and T. G. Hennessy. Rept. on Contract AT(40-1)-GEN-12. July 61, 29p.

UCRL-9862 $1.50

Lawrence Radiation Lab., U. of California, Berkeley. RED CELL MASS AND LIFE SPAN IN THE RAT DURING PERIODS OF PHYSIOLOGICAL HYPER-TRANSFUSION, by Howard G. Parker. Rept. on Contract W-7405-eng-48. Sep 61, 63p.

LAMS-2627 $4.00

Los Alamos Scientific Lab., N. Mex. BIOLOGICAL AND MEDICAL RESEARCH GROUP (H-4) OF THE HEALTH DIVISION. Semiannual rept. Jan-June 61, on Contract W-7405-eng-36. Oct 61, 309p.

ORNL-TM-29 $1.10

Oak Ridge National Lab., Tenn. INFLUENCE OF RADIATION FROM AN UNSHIELDED REACTOR ON A NATURAL MICROFLORA, by Martin Witkamp. Oct 61, 8p.

PB 159 006 $9.60

USAF Radiation Lab., U. of Chicago, Ill. QUARTERLY PROGRESS REPORT NO. 36. Rept. on Contract AF 41(657)252. 15 July 60, 116p. 68 refs. AD-240 720.

DESCRIPTORS: *Radiation injuries, Countermeasures, Serotonin, Dehydrogenases, Life expectancy, Biochemistry, *Tissues (Biology), Enzymes, Rare earth compounds, Toxicity, Dose rate, Therapy, Inhibition, Drugs, Pharmacology, X-rays, Carbamates.

Contents:
The effects of ionizing radiations on the biochemistry of mammalian tissues
The ability of various chemical compounds to modify the radiation-induced changes in enzyme activities in certain tissues

The inhibitory action of radioprotective dithio-carbamates on succinic dehydrogenase activity of animal tissues
Studies on the toxicity of rare earth compounds and influence on radiation lethality
Pharmacological and toxicological compounds as protective or therapeutic agents against radiation injury in experimental animals
The influence of various tissue extracts on radiation lethality in mice
The influence of various chemical compounds on radiation lethality in mice
Pharmacological studies on the radioprotective activity of serotonin
The influence of exposure to low levels of gamma and fast neutron irradiation on the life span of mice
Chemical protection against chronic irradiation injury in mice.

CHEMISTRY

Analytical Chemistry

IS-337 $2.50

Ames Lab., Iowa State U. [of Science and Tech.]
ANION EXCHANGE SEPARATIONS OF METAL IONS IN PARTIALLY NONAQUEOUS SOLUTIONS, by Donald John Pietrzyk and J. S. Fritz. Nov 60, 118p.

IS-340 $0.75

Ames Lab., Iowa State U. [of Science and Tech.]
SEPARATION OF METAL IONS ON CHELATING RESIN, by Raymond David Szidon and J. S. Fritz. May 61, 31p.

IS-220 $1.25

Ames Lab., Iowa State U. [of Science and Tech.]
TEMPERATURE AND FLOW RATE EFFECTS ON THE ION-EXCHANGE SEPARATION OF ERBIUM AND THULIUM, by Irvin Leroy Sellers and J. E. Powell. May 60, 53p.

Order from GPO $0.45 as
I 28.3:593

Bureau of Mines, Washington, D. C.
COMPOSITION OF SHALE-OIL NAPHTHA, by G. U. Dinneen, R. A. Van Meter and others. 1961, 74p. 180 refs. Bulletin 593.

DESCRIPTORS: *Shales, *Oils, *Naphtha, *Hydrocarbons, Determination, Gasoline, Petroleum

This report describes the analysis of shale-oil naphthas and discusses their composition. Individual compounds identified in this investigation are listed, together with those reported previously in the literature Quantitative data are given on the occurrence of individual compounds and groups of related compounds. A comprehensive analysis is presented for a naphtha from shale oil produced in an N-T-U (Nevada-Texas-Utah) retort from Green River shale. Results of less detailed analyses are given for 13 other naphthas from Colorado shale oils, for 1 naphtha from Tennessee shale oil, and for 26 naphthas from oils from foreign countries. A description of the general analytical approach used and of techniques developed especially for analyzing shale-oil distillates is included. (Author)

LA-387(Del.) $3.60

Los Alamos Scientific Lab., N. Mex.
SPECTROCHEMICAL ANALYSIS OF PLUTONIUM AND ITS COMPOUNDS II. THE CUPFERRON PROCEDURE, by H. A. Potratz, N. H. Nachtrieb and others. Sep 45, 36p.

Inorganic Chemistry

IS-118 $2.25

Ames Lab., Iowa State U. [of Science and Tech.]
A CALCULATION OF THE ELASTIC CONSTANTS OF YTTRIUM AND THE RARE-EARTH METALS, by Benjamin T. Bernstein and John F. Smith. Nov 59, 110p.

IS-338 $3.00

Ames Lab., Iowa State U. [of Science and Tech.]
SOME PHYSICAL PROPERTIES OF RARE-EARTH CHLORIDES IN AQUEOUS SOLUTION, by Victor William Saeger and F. H. Spedding. Nov 60, 207p.

IS-333 $1.25

Ames Lab., Iowa State U. [of Science and Tech.]
ZERO FIELD MAGNETIC PROPERTIES OF GADOLINIUM, TERBIUM AND SAMARIUM, by Emma Daniels Hill and F. H. Spedding. Nov 60, 52p.

Organic Chemistry

IS-341 $1.50

Ames Lab., Iowa State U. [of Science and Tech.]
ACID-BASE PROPERTIES OF CARBON BLACK SURFACES, by Roy Eugene Test and Robert S. Hansen. May 61, 56p.

PB 156 069 $1.10

Johns Hopkins U., Baltimore, Md.
THE SYNTHESIS AND CERTAIN REACTIONS OF NITROALKANES AND NITROAMINES, by Emil H. White, Bernard E. Weller, and Hanspeter Scherrer. Final rept. on Contract DA 36-034-ORD-2581. 31 Mar 61, 8p. OOR #1737:1; AD-254 710.

DESCRIPTORS: *Synthesis, Chemical reactions, *Nitro radicals, *Amines, Methanes, *Nitramines, Nitrogen compounds, Oxychlorides, Alkyl radicals, Ethylenes.

Nitrosyl chloride was reacted with butylamine, hexylamine, tert-butylamine, 1-phenylethylamine, tritylamine, benzhydrylamine, and with 9, 10-dihydro-9, 10-ethyleno-9-amino-anthracene. Diazomethane was not detected in the reaction of nitrosyl chloride with methylamine. A study of the reactivity of the triazenes led to the triazene method for the deamination of aliphatic amines.

TID-13811 $1.10

McCollum-Pratt Inst., Johns Hopkins U., Baltimore, Md.
THE SEPARATION OF DIASTEREOISOMERIC CYSTATHIONINES, by Joseph R. Riden, Jr. and Robert Ballentine. Oct 61, 6p.

Physical Chemistry

IS-332 $1.25

Ames Lab., Iowa State U. [of Science and Tech.]
EQUILIBRIUM DISTRIBUTION STUDIES OF DYSPROSIUM NITRATE-ERBIUM NITRATE-NITRIC ACID-TRIBUTYL PHOSPHATE SYSTEMS, by Michael Robert Dinnin, Jr. and Morton Smutz. Nov 60, 50p.

IS-335 $1.50

Ames Lab., Iowa State U. [of Science and Tech.]
EQUILIBRIUM OF THE SYSTEM LANTHANUM NITRATE-PRASEODYMIUM NITRATE-NITRIC ACID-WATER-TRIBUTYL PHOSPHATE, by Brooks Martin Sharp and Morton Smutz. Nov 60, 60p.

IS-330 $2.75

Ames Lab., Iowa State U. [of Science and Tech.]
GASEOUS DIFFUSION AT MODERATE FLOW RATES IN CIRCULAR CONDUITS, by George Roley and R. W. Fahien. July 60, 162p.

TID-14101 $1.60

Michigan U., Ann Arbor.
LOW TEMPERATURE CHEMICAL THERMODYNAMICS OF THE LANTHANIDE SESQUIOXIDES, by Edgar F. Westrum, Jr., and Bruce H. Justice. 15p.

TID-14097 $1.60

Michigan U., Ann Arbor.
POLAROGRAPHIC REDUCTION OF THE PHENYL-SUBSTITUTED ETHENES. II. ELECTROCHEMICAL KINETIC PARAMETERS AND MECHANISM IN DIMETHYLFORMAMIDE, by Philomena G. Grodzka and Philip J. Elving. Rept. no. 65 on Contract AT(11-1)-70. Oct 61, 20p.

PB 158 943 $1.60

Surface Chemistry Lab., Lehigh U., Bethlehem, Pa.
ADSORPTION STUDIES OF METALS. IX. THE NATURE OF THE THERMAL REGENERATION OF OXIDE-COATED NICKEL COBALT AND COPPER, by A. C. Zettlemoyer, Yung-Fang Yu, and J. J. Chessick. [Rept. on Contract DA 36-039-sc-78237]. 14 Jan 60, 15p. 5 refs. AD-231 375.

DESCRIPTORS: *Metals, Adsorption, Surface properties, *Oxidation, Nickel, Cobalt, Copper, Temperature, Oxides, Coatings, Thermodynamics.

Main emphasis was placed on the completion of a paper on the nature of the thermal regeneration process of oxide-coated metals. It is well known that oxidation of nickel, cobalt and copper at 25° proceeds by two steps, a fast followed by a slow process. Upon heating these oxide-coated metals at modest temperatures such as 300°, oxidation will again proceed by a rapid step at 25°. The regeneration could be due to (a) migration of metal ions to join O^- ions on the surface; or (b) dissolution of the oxide film in the bulk metal; or (c) crystallization of the oxide film to reveal bare metal. In this work, organic vapors were used as a probe for any bare metal surface uncovered during regeneration. The heats of adsorption of n-propyl amine and acetic acid on the bare, oxide-coated and regenerated metal surfaces support the contention of Dell [J. Phys. Chem., 62:1139, 1958] that recrystallization occurs. That is to say, initial heats of adsorption were much higher on the regenerated surfaces, in accord with the values for the freshly reduced metals, and were much lower on the oxide-coated surfaces. Extents of irreversible adsorption followed the pattern to be expected from the heat measurements. (Author)

EARTH SCIENCES

Climatology and Meteorology

Order from GPO $0.25 as
SI 3.3:228/paper 23

United States National Museum, Washington, D. C.
THE INTRODUCTION OF SELF-REGISTERING METEOROLOGICAL INSTRUMENTS, by Robert P. Multhauf. 1961, pages 95-116 from Contributions from the Museum of History and Technology Paper 23. US National Museum bulletin 228.

DESCRIPTORS: *Meteorological instruments, History, Instruments

The majority of the instruments upon which the self-registering systems of the late 19th century were based had been proposed and, in most cases, actually constructed in the 17th century. The essential difference between the 17th and 19th centuries that made possible the development of the self-registering observatory would appear to have been a difference of degree—the maturation in the 19th century of certain features of the 17th. The most important of these features were the spread throughout the western world of the spirit that had animated the scientific societies of Florence and London, the continued popularity of the astronomical observatory as an object of the philanthropy of an affluent society, and the continued existence of the nonspecialized scientist.

AD-257 831 $9.60

Weather Bureau, Washington, D. C.
SOME FURTHER STUDIES ON THE METEOROLOGY OF THE GREENLAND AREA, by P. Putnins, V. J. Creasi, and H. E. Rosendal. Final rept. 1 Nov 60-31 Jan 61, on Proj. DA 3-99-00-500. Mar 61, 112p. 28 refs. MIPR no. R-65-8-99831-SC-03-91.

This report released by the cogizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Atmosphere, *Stratosphere, *Air mass analysis, Barometric pressure, Temperature, High altitude, Surface properties, Meteorological charts, Climatic factors, Greenland, Arctic regions, Tables, Meteorology

Contents:
Correlation between pressure changes aloft and at the surface in the Greenland area, and some aspects of the steering problem
An analysis of an extreme case of air mass change over the Greenland ice cap
Correlation between some upper air elements at the ice cap and Greenland coastal stations
A case of cyclogenesis at the west coast of Greenland, 15-16 Mar 50

Frost Science

PB 159 053 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
EXPERIMENTAL FORMATION OF SORTED PATTERNS IN GRAVEL OVERLYING A MELTING ICE SURFACE, by Arturo E. Corte. Rept. on Field and Laboratory Study of Patterned Ground. July 59, 20p. 3 refs. Research rept. 55; AD-225 269.

DESCRIPTORS: *Soils, Rock, Deposits, *Glaciers, Melting, Mechanical properties, Greenland.

Experiments were performed to investigate the processes involved in the formation of sorted patterns which occur naturally in unconsolidated sandy gravel deposits covering the edge of the ice cap southeast of Thule, northwest Greenland. Four different glacier ice surfaces were covered with various thicknesses of sandy gravel in order to observe the effect of differential melting on the formation of sorted patterns. The different stages of pattern formation were recorded by photographs taken at 7-day intervals. A thin gravel cover of 2 in. allowed more rapid melting than did a cover of 6 in., with the result that depressions and mounds were formed. Coarse particles were segregated in the depressions by natural sorting of the various particles sizes when set in motion by differential melting and resulting uneven collapse of the gravel cover. The sorting produced well-developed stone rings in three of the areas, caused directly by the differential insulation provided by the gravel cover. In the fourth area a uniform gravel cover over a smooth ice surface produced no sorted nets, although a poorly developed stone stripe was formed in a melt-stream channel. (Author)

PB 159 056 $5.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
EXPERIMENTAL RESEARCH ON DESICCATION CRACKS IN SOIL, by Arturo Corte and Akira Higashi. Rept. on Model Studies of Patterned Ground. Aug 60, 59p. 8 refs. Research rept. 66.

DESCRIPTORS: *Soils, Model tests, Physical properties, Greenland.

A simple theory is proposed for crack formation and development by soil desiccation on the basis of laboratory experiments utilizing soil samples (Bloomington till) with max particle size of 1 mm diam held in flat wooden containers. The crack pattern is more dependent on the thickness of the soil sample than on temperature or humidity. Some effect is caused also by differences in the bottom material of the containers. The area of cells made by crack patterns has a log normal size distribution. Total length of cracks decreases with increase in sample thickness. The number of sides of cells also depends on the thickness. Cracking was found to begin from the center of the soil layer and to propagate to the surface or bottom with non-uniform speed.

PB 159 054 $9.10

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
PHYSICAL INVESTIGATIONS ON THE SNOW AND FIRN OF NORTHWEST GREENLAND 1952, 1953, AND 1954, by Carl S. Benson. Rept. on Structure of Ice Cap Névé in Greenland. Sep 59, 110p. 46 refs. Research rept. 26; AD-239 701.

DESCRIPTORS: *Snow, Physical properties, Density, Depth finding, Greenland.

The results of temperature, density, ram-hardness and grain-size measurements at 118 test sites along a 300-mi traverse, ranging in elevation from 2000 to 8000 ft, are reported in detail, and their meteorological and climatic implications are discussed. Four types of diagenetically produced facies were recognized: ablation facies, extending from the snout of the glacier to the firn line; soaked facies, extending from the firn line to the saturation line; percolation facies, extending from the saturation line to the dry-snow line; and dry-snow facies, extending across the glacier above the dry-snow line. The well defined saturation line shows marked discontinuities in temperature, density, and ram hardness, while the dry-snow line is a transition zone 10-20 mi wide. The recognition of facies allows greater resolution of glacier characteristics than Ahlmann's classification, permitting quantitative subdivision of all types of large glaciers. Regional precipitation (entirely from cyclonic storms) is about 5 times greater than at Thule. The prevailing katabatic winds control the vertical component of the temperature gradient in the snow and firn. The depth-density curve of the firn at elevations where melt is negligible is invariant with time, so that the densification can be treated as a steady-state situation with load as the only significant variable. (Author)

PB 159 055 $1.60

Army [Cold Regions Research and Engineering Lab.] Wilmette, Ill.
TEMPERATURE DISTRIBUTION OF AN IDEALIZED ICE CAP, by Chi Tien. Rept. on Thermal Properties of Snow and Ice. July 60, 13p. 8 refs. Research rept. 64.

DESCRIPTORS: *Glaciers, Temperature, Distribution, Growth, Mathematical analysis, Greenland.

The problem is analyzed mathematically, assuming that the icecap has constant physical properties, that it grows at a constant rate from an initial zero thickness, is internally static, and subject to a linear climatic change and a constant geothermal heat flux. The results are compared with direct measurements in Greenland and in the Ross Ice Shelf. The problem is treated as a Stefan-type problem, and the solution is obtained by the principle of superposition. The results indicate that the temperature at the base of the icecap increases with time, and eventually would reach the melting point of ice. Under such conditions the icecap is not resting on permafrost as suggested earlier. The predicted results agree fairly well with direct measurements for greater depths.

PB 159 052 $12.50

Ohio State U. Research Foundation, Columbus.
STUDY OF ICE CLIFF IN NUNATARSSUAQ, GREENLAND, by R. P. Goldthwait. Final rept. on Contract DA 11-190-eng-19. Oct 60, 178p. 35 refs. Army Cold Regions Research and Engineering Lab. Technical rept. 39.

DESCRIPTORS: *Glaciers, Greenland.

The present activity and history of an ice cliff on the E. margin of North Ice Cap (near its junction with the main Greenland Ice Cap) and of adjacent glaciers are deduced on the basis of detailed glaciological, meteorological, geomorphological, and botanical studies in the summers of 1955 and 1956. Detailed descriptions are given of the climatic, ablation, and runoff regimes of the glacier, the motion of the ice-cliff surface and glacier surface and base, the structure of the ice, including physical properties, foliation and fracture, crystal distortion, and englacial strain. (Author)

Geology

Order from GPO $2.75 as
I 19.16:357

Geological Survey, Washington, D. C.
CHATTANOOGA SHALE AND RELATED ROCKS OF CENTRAL TENNESSEE AND NEARBY AREAS, by Louis C. Conant and Vernon E. Swanson. 1961, 91p. 170 refs. Geological Survey Professional Paper 357.

DESCRIPTORS: *Shales, *Rock, *Geology, Geological survey, Tennessee

The Chattanooga shale and Maury formation, which have a combined thickness of about 35 feet, crop out on the steep slope between the Nashville Basin and the surrounding Highland Rim; outside the basin they are exposed in several river valleys and in folded areas. Throughout most of the area studied these rocks are nearly flat lying, but in the southeastern part they have been involved in the Appalachian folding and are commonly contorted and sheared. The Chattanooga shale, now considered to be of Late Devonian age, lies unconformably on many formations ranging in age from Middle Ordovician to Middle Devonian. It is overlain, with probable local disconformity, by the Maury formation, chiefly of Mississippian age, which is overlain conformably by the Fort Payne chert and related rocks.

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I 19.16:305-K

Geological Survey, Washington, D. C.
CORE TESTS AND TEST WELLS, BARROW AREA, ALASKA. EXPLORATION OF NAVAL PETROLEUM RESERVE NO. 4 AND ADJACENT AREAS, NORTHERN ALASKA, 1944-53. PART 5. SUBSURFACE GEOLOGY AND ENGINEERING DATA, by Florence Rucker Collins. 1961, 76p. 6 refs. Geological Survey Professional Paper 305-K.

Included in the report is:
Temperature measurement studies, by Max C. Brewer

DESCRIPTORS: *Petroleum, Sources, Exploration, *Well drilling, Tests, *Geology, Geological survey, Alaska, Naval operations

Between 1944 and 1953 exploration of Naval Petroleum Reserve No. 4, northern Alaska, by the U. S. Navy, resulted in the drilling of 10 test holes in the vicinity of Point Barrow. Five were relatively shallow core tests, drilled for stratigraphic information; five were test wells 2,505 to 4,020 feet deep, two of which produced a flow of gas sufficient to heat the Navy's base camp near Point Barrow. The rocks penetrated by one or more of the holes include sand, gravel, and silt of the Gubik formation of Pleistocene age, Cretaceous shale with a little interbedded sandstone in the upper part, Jurassic siltstone, sandstone, and shale, Triassic limonitic oolites, limestone and siltstone, and pre-Mesozoic argillite, siliceous dolomite, and chert. The gas came primarily from the Jurassic beds, although some may have been held in fractures in the argillite. The area is structurally complex, with steep dips not only in the pre-Mesozoic but in the Mesozoic beds as well, in the eastern-most test; the pre-Mesozoic rocks are about 4,000 feet nearer the surface in the Barrow area than anywhere else in the coastal plain. (Author)

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I 19.16:303-C

Geological Survey, Washington, D. C.
GEOLOGY OF THE UTUKOK-CORWIN REGION, NORTHWESTERN ALASKA. EXPLORATION OF NAVAL PETROLEUM RESERVE NO. 4 AND ADJACENT AREAS, NORTHERN ALASKA, 1944-53. PART 3, AREAL GEOLOGY, by Robert M. Chapman and Edward G. Sable. 1961, 167p. Geological Survey Professional Paper 303-c.

DESCRIPTORS: *Geology, *Geophysical prospecting, Geography, *Petroleum, Naval operations, *Alaska.

RME-98(Rev.) $2.00

Grand Junction Operations Office, Colo.
GEOLOGY OF THE GREEN RIVER MINING DISTRICT, EMERY AND GRAND COUNTIES, UTAH, by R. G. Young, Isadore Million and D. M. Hausen. Sep 60, 89p.

ENGINEERING

TID-13440 $5.60

Purdue Research Foundation, Lafayette, Ind.
THE COEFFICIENT OF VOLUME EXPANSION FOR WATER AND WATER VAPOR IN THE CRITICAL REGION, by E. S. Nowak and R. J. Grosh. Rept. on Contract AT(11-1)-1026. July 61, 40p.

SCR-83A $1.00

Sandia Corp., Albuquerque, N. Mex.
POSITIONAL TOLERANCING AT SANDIA CORPORATION. Sep 61, 39p.

PB 171 471 $12.00 Set (Parts I-II)

Society of Naval Architects and Marine Engineers [New York].
MANUAL OF PROPERTIES OF COMBINED BEAM AND PLATE. PART I. TEES AND ANGLES; PART II. FLANGED PLATE. [1961] 833p.

DESCRIPTORS: *Ships, *Beams, *Ship plates, *Flanges, Elasticity, Tensile properties, Tables, Handbooks

These tables are intended to be used in the design of ship structure where the plate is considered acting as one of the flanges of the attached member. The tables given are: Effective breadths and equivalent areas
Properties for I-T's; 60T, 50T, 40T, 30T
Properties for -L's and L's; 60T, 50T, 40T, 30T
Properties for flanged plates: 60T, 50T, 40T, 30T

Chemical Engineering

PB 158 935 $2.60

Chesapeake Bay Inst., Johns Hopkins U., [Annapolis, Md.]
A SMALL PORTABLE SALINOMETER, by Jerome Williams. Rept. on Contract Nonr-248(20). Jan 61, 23p. 7 refs. Technical rept. no. 23; Reference 61-2; AD-251 085.

DESCRIPTORS: *Salinometers, *Sea water, Analysis, Electrical conductance, Salinity, Temperature, Measurement, Conductivity, Determination, Design, Wiring diagrams, Circuits, Instrumentation, Electrochemistry.

Salinity may be calculated from a known relationship involving the electrical conductivity and water temperature. A small portable instrument operating from flashlight batteries is described which measures these two parameters in situ and essentially performs the calculation to a direct readout accuracy of + or - 0.3% salinity. With the aid of calibration data this accuracy may be increased to + or - 0.05% salinity. (Author)

ORO-452 $3.60

Dorr-Oliver Inc., Stamford, Conn.
ACHIEVABLE RESULTS OF RADIOACTIVE SLUDGE DEWATERING BY CONTINUOUS CENTRIFUGATION. Rept. on Contract AT(40-1)-2746. May 61, declassified 8 Sep 61. 35p.

HW-68786 $1.10

Hanford Atomic Products Operation, Richland, Wash.
INCORPORATION OF ION-EXCHANGE IN THE HOT SEMIWORKS SOLVENT EXTRACTION STRONTIUM FACILITY, by L. A. Bray. Rept. on Contract AT(45-1)-1350. Mar 61, 10p.

HW-59919 $2.60

Hanford Atomic Products Operation, Richland, Wash.
LIMITATIONS FOR EXISTING STORAGE TANKS FOR RADIOACTIVE WASTES FROM SEPARATIONS PLANTS, by E. Doud and H. W. Stivers. Oct 59, 22p.

HW-63051 $1.60

Hanford Atomic Products Operation, Richland, Wash.
THE RECOVERY OF FISSION PRODUCT RARE EARTH SULFATES FROM PUREX IWW, by E. J. Wheelwright and W. H. Swift. Rept. on Contract AT(45-1)-1350. May 61, 13p.

HW-55963(Del.) $2.60

Hanford Atomic Products Operation, Richland, Wash.
THE SELF-CONCENTRATION OF HIGH LEVEL PUREX WASTES IN THE HOT SEMIWORKS WASTE CONCENTRATOR, by R. D. Dewitt and R. J. Sloat. Jan 59, declassified with deletions 14 July 59. 29p.

HW-69667 $0.50

Hanford Atomic Products Operation, Richland, Wash.
SHEAR DEVELOPMENT FOR THE NONPRODUCTION FUELS REPROCESSING PROGRAM, by V. P. Kelly. Final rept. on Contract AT(45-1)-1350. May 61, 23p.

UCRL-9767 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
A LOW-SPEED SWINGING-BUCKET ULTRACENTRIFUGAL ROTOR, by Frank T. Lindgren. Rept. on Contract W-7405-eng-48. Aug 61, 12p.

TID-13818 $1.60

McCollum-Pratt Inst., Johns Hopkins U., Baltimore, Md.
A LINEAR-GRADIENT MIXING DEVICE FOR VISCOUS SOLUTIONS 1,2, by G. Lew Choules. Rept. on Contract AT(30-1)-1822. Oct 61, 14p.

IDO-14561 $0.50

Phillips Petroleum Co., Idaho Falls.
AIR LIFT PERFORMANCE AT LOW LIQUID RATES USING OVERSIZED PIPING AND LATERAL RUNS, by H. V. Chamberlain. Rept. on Contract AT(10-1)-205. Oct 61, 19p.

IDO-14553 $1.75

Phillips Petroleum Co., Idaho Falls.
CHEMICAL PROCESSING TECHNOLOGY, ed. by J. R. Bower. Quarterly progress rept. Oct-Dec 60, on Contract AT(10-1)-205. May 61, 76p.

IDO-14560 $2.00

Phillips Petroleum Co., Idaho Falls.
CHEMICAL PROCESSING TECHNOLOGY, ed. by J. R. Bower. Quarterly progress rept. Jan-Mar 61, on Contract AT(10-1)-205. Aug 61, 93p.

IDO-14430(Del.) $7.60

Phillips Petroleum Co., Idaho Falls.
IDAHO CHEMICAL PROCESSING PLANT. Technical progress rept. Oct-Dec 57, on Contract AT(10-1)-205. Feb 58, declassified, 78p.

IDO-14562 $0.75

Phillips Petroleum Co., Idaho Falls.
MIXING AND EVAPORATION IN A PACKED VESSEL, by G. K. Cederberg and J. A. Buckham. Rept. on Contract AT(10-1)-205. Sep 61, 32p.

IDO-14359 $2.60

Phillips Petroleum Co., Idaho Falls.
TESTING A HALF-SCALE PROTOTYPE OF THE ICPP CONTINUOUS DISSOLVER FOR ALUMINUM FUEL ALLOYS, by A. F. Boeglin and J. A. Buckham. Rept. on Contract AT(10-1)-205. Dec 55, declassified 3 Feb 61. 26p.

DP-646 $0.50

Savannah River Lab., Aiken, S. C.
ABSORPTION SYSTEM FOR RADIOACTIVE IODINE, by A. E. Symonds, Jr. Rept. on Contract AT(07-2)-1. Sep 61, 11p.

K-1477 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
REMOVING MAJOR CONTAMINANTS FROM NITROGEN GENERATOR W-7405-eng-26. Nov 61, 16p.

Civil Engineering

Order from GPO $0.50 as
D 103.6/3:1110-2-2502

Engineer Corps, Washington, D. C.
RETAINING WALLS. Engineering and Design Manual. 29 May 61, 12p. 7 refs. EM 1110-2-2502.

DESCRIPTORS: *Levees, Design, Earth, Pressure, Load distribution, Foundations (Structures), Stability, Civil engineering, Instruction manuals

This manual sets forth general procedures for the design of concrete gravity or cantilever retaining walls. It is intended as a guide to uniformly safe design, however, variations are permissible provided they are necessary and the resulting structure is as safe, and as economical, as a structure produced by the methods suggested herein. This manual is intended for the guidance of Division and District Engineers responsible for designing walls the principle function of which is to maintain differences in adjacent ground surface elevations. (Author)

Order from GPO $0.35 as
D 103.6/3:1110-345-292

Engineer Corps, Washington, D. C.
RIGID PAVEMENTS FOR ROADS, STREETS, WALKS, AND OPEN STORAGE AREAS. Engineering and Design Manual. 30 June 61, 42p. 11 refs. EM 1110-345-292.

DESCRIPTORS: *Civil engineering, Roads, *Pavements, Design, Military facilities, Construction, Instruction manuals

This manual establishes criteria for guidance of Corps of Engineers personnel in the design of rigid pavements for roads, streets, walks, and open storage areas at U. S. Army and Air Force installations for the loadings and conditions set forth herein. It is applicable to those Divisions and Districts responsible for the design and construction of Army and Air Force facilities. (Author)

Electrical and Electronic Engineering

PB 158 958 $18.00

Arinc Research Corp., Washington, D. C.
ELECTRONIC RELIABILITY IN MILITARY APPLICATIONS. General rept. no. 2 on Contract NObsr-64508, continuation of Contract NObsr-52372. 1 July 57, 282p. 67 refs. Publication no. 102.

DESCRIPTORS: *Electron tubes, *Electronic equipment, *Military equipment, Reliability, Military requirements.

The purposes of this publication--General Report No. 2--are to synthesize the cumulative results of almost six years of field observation and laboratory studies of military equipments; to present available information on failure mechanisms producing unreliability in electron tubes and electronic equipments; to draw general inferences concerning the causes of unreliability; and to suggest design methods, operating practices, and maintenance procedures that will contribute to higher reliability. (Author)

AD-257 999 $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
108-MC PRECISION FREQUENCY GENERATOR, by D. Schwab and H. D. Tanzman. Nov 60, 30p. 1 ref. USASRDL Technical rept. 2166.

This report released by the cognizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Radiofrequency generators, Very high frequency, Radiofrequency power, Power amplifiers, Frequency stabilizers, Quartz crystals, *Crystal oscillators, Microwave oscillators, *Microwave amplifiers, Frequency multipliers, Power supplies, Design, Tests, Test methods

A system to supply a minimum of 10 watts, 108-mc signal with a frequency stability of 1×10^{-9}/sec for a period of thirty minutes is described. The system is housed in a standard relay rack and contains an ultra-precise 1-mc crystal oscillator, frequency multipliers, power amplifier, and power supplies. Test results indicate a frequency stability of 5×10^{-10} for a sampling period of 1 second in the interval of 30 minutes. The system is described completely and testing techniques are outlined. (Author)

PB 157 578 $1.60

Bell Telephone Labs., Inc., New York.
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTRACTS, by O. M. Hovgaard. Quarterly rept. no. 11, 15 Sep-14 Dec 59, on Contract DA 36-039-sc-72835. 14 Jan 60, 17p. AD-236 006.

DESCRIPTORS: *Electric switches, Design, Model tests, *Electric relays, Miniature electronic equipment, Seals, Switches.

Studies of exploratory coordinate arrays of latching relays using G29 miniature switches have been completed A 3-by-3 array of 4-wire crosspoints showed promising transmission characteristics at 0.5 megacycles and the possibility of usefulness up to 4 or 5 megacycles. The 8-by-8 switching array exhibited restrictive margins with respect to magnetic interference between crosspoints and the need for close selection of switches for individual crosspoints. Magnetically latching relays providing 2 and 4 make contacts were also studied. (Author) (See also PB 157 577)

PB 157 579 $1.60

Bell Telephone Labs., Inc., New York.
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTRACTS, by O. M. Hovgaard. Quarterly progress rept. no. 12, 15 Dec 59-14 Mar 60, on Contract DA 36-039-sc-72835. 14 Apr 60, 13p. AD-238 200.

DESCRIPTORS: *Electric switches, *Electric relays, Miniature electronic equipment, Seals, Design, Model tests, Switches.

Preliminary life tests of G29 miniature sealed contacts operated under conditions simulating those to be experienced in latching types of relays indicate that the life expectancy may be less than previously reported for the nonlatching conditions. The phenomenon appears to be related to the continuous presence of magnetic flux which may increase the opportunity for particles to bridge the open contacts. (Author) (See also PB 157 578)

PB 157 580 $6.60

Bell Telephone Labs., Inc., New York.
RESEARCH AND DEVELOPMENT WITH HERMETICALLY SEALED CONTACTS, by O. M. Hovgaard. Final rept. 15 Mar 57-14 Aug 60, on Contract DA 36-039-sc-72835. 14 Oct 60, 62p. AD-250 749.

DESCRIPTORS: Design, *Electric relays, Miniature electronic equipment, Seals, Life expectancy, Switching circuits, *Electric switches, Switches, Miniature electrical equipment,

Consideration was given to the selection from several experimental designs of dry-reed switches of the one most suitable to use as the basis for this study. This proved to be the Bell Laboratories G-29 design and its life performance at 28 volts dc was explored in detail. It also served as the means for studying a large variety of possible miniature relays. Models examined contained from 1 to 4 switches within a single operating coil and the problems of providing make, break and transfer contact combinations were explored. Magnetic latching types of relays providing make contacts were studied as was their application to switching arrays for frequencies up to 10 megacycles. This contract has provided fundamental information on the characteristics and life expectancy of G-29 switches and indicated many of the problems which must be considered in the design of relays and switching structures. (Author) (See also PB 157 579)

AD-258 445 $2.60

Bell Telephone Labs., Inc., North Andover, Mass.
QUARTZ CRYSTAL CONTROLLED OSCILLATORS, by W. L. Smith and W. J. Spencer. Interim rept. no. 2, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85373. 10 Apr 61, 25p. 5 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Quartz crystals, *Crystal oscillators, Oscillators, *Frequency stabilizers, Guided missiles, Stability, Satellite vehicles, Cricuits, Crystal ovens, Oscillator circuits, Crystals, Vibration, Acceleration, Temperature, Aging, Design, Crystal holders, Test, Measurement

Vibration and acceleration testing of the precision 5 mc crystal unit, fabricated with 0.005" thick, 0.100" long supporting ribbons, indicate that 6g intensity vibration up to 2,000 cps and 15g steady acceleration within a few degrees of a preferred axis will produce no more that ±2 parts in 10^9 frequency deviation. Temperature stability measurements and frequency aging characteristics are presented.

PB 156 215 $8.60

Bell Telephone Labs., Inc., Whippany, N. J.
AN ULTRA-PRECISE STANDARD OF FREQUENCY, by W. L. Smith. Final rept. 12 July 56-9 June 60, on Contract DA 36-039-sc-73078. 1 Dec 60, 99p. Rept. no. 27480-M; AD-253 034.

DESCRIPTORS: Radiofrequency, Stability, *Crystal oscillators, Tests, Design, Airborne, *Oscillator circuits, Electronic circuits, *Quartz crystals, *Satellite vehicles, *Miniature electronic equipment, Standards, *Guided missiles, Circuits, Oscillators.

This report includes (1) discussion of the characteristics of GT-cut, and AT-cut crystal units operating at temperatures from 4 K to about 80 C; (2) discussion of the performance of specially designed AT-cut overtone mode crystal units subjected to sustained acceleration and mechanical vibration; (3) analysis of vacuum tube and transistor oscillator circuits, showing the effects on frequency of parameter variation; (4) a description of brass board circuits designed for optimum frequency stability under fixed station conditions; and (5) description of a miniature transistor oscillator intended for use in a satellite environment. Several 5 mc AT-cut, double-convex, ribbon-mounted, fifth overtone crystal units were made which meet the target requirements for frequency stability during sustained acceleration. Behavior of these units during mechanical vibration was determined. Aging tests of 2.5 mc, fifth overtone, AT-cut crystal units operating in the temperature range from 40 to 50 C were made and rates of a few parts in 10 to the 10th power per month were obtained with a few units. Experimental results verified the expected improvement in frequency stability of the multistage oscillator circuits when subjected to changes in circuit parameters and supply voltages. Design information and test results are given for the miniature satellite oscillator. (Author)

BNL-5749 $1.60

Brookhaven National Lab., Upton, N. Y.
MODIFICATIONS OF THE WIDE-BAND SUM ELECTRODE SYSTEM, by H. Hahn and H. J. Halama. Sep 61, 9p.

PB 155 845 $5.60

Colorado U., Boulder.
MILLIMETER WAVE TRANSITIONS FOR FREQUENCY CONTROL, by Frank Barnes, Donald Burkhard, and Masataka Mizushima. Quarterly progress rept. no. 2, 11 July-10 Oct 60, on Contract DA 36-039-sc-85313. [1960] 54p. 6 refs. AD-250 155.

DESCRIPTORS: Microwave frequency, *Frequency stabilizers, Standards, Control, Molecules, Resonance, *Molecular rotation, *Molecular beams, Electron transitions, Electron bombardment, Mass spectrometers, Ionization gages, Ionization, Ionization potentials, Alkali metals, Detectors, Thermionic emission, Beams.

Research on molecular transitions in the region above 100 kmc is directed toward developing a frequency standard which can be expected to have a greater precision than the cesium beam machines currently in use. A brief review of the theory of surface ionization detectors is presented as preparation for an experimental study. In addition, some of the properties and problems in the construction of an electron bombardment mass spectrometer detector are discussed with respect to the choice of a molecule for a molecular frequency standard. The results of the calculations for the population fractions and the small signal Stark effect are presented for the most interesting transitions in H_2S. The results of the Stark effect calculations for HDO and H_2O are included for the most promising transitions with low J values. Calculations are presented for the Stark effect, population fractions, and transition frequencies for methyl alcohol are presented. (Author)

PB 158 929 $2.60

Crosby Labs., Inc., Syosset, N. Y.
SINGLE SIDEBAND SIGNAL GENERATOR STUDY, by R. Theodore Nelson. Final rept. for 16 Jan 56-31 July 59 on Contract DA 36-039-sc-70163. [1959] 23p. AD-228 684.

DESCRIPTORS: *Signal generators, *Radio receivers, Test equipment, *Sidebands, *Radio communication systems, Communication equipment, Oscillator circuits, Design, Maintenance, Generators.

Two service test units of signal generator SG-200(XC-1)/G were constructed. The generator provides the many accurate test functions required to test and evaluate single sideband receiving components. It provides outputs in 3 frequency ranges: 100kc, 455kc, and 1 mc to 30 mc. Facilities for external modulation (double or single sideband), internal 2-tone sideband generation, AFC sweep and frequency shift functions, monitoring, and calibration are provided. Precision attenuators and frequencies are included. Distortion and intermodulation products are maintained at very low levels with a maximum output signal level of one volt per signal across the unterminated 50 ohm output. (Author)

AD-258 131 $4.60

David Sarnoff Research Center, Princeton, N. J.
SEMICONDUCTOR PHOTOVOLTAIC CONVERSION, by J. J. Wysocki, B. Goldstein and others. Triannual rept. no. 1, 1 Nov 60-28 Feb 61, on Contract DA 36-039-sc-87417. 31 Mar 61, 41p. 10 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Semiconductors, *Solar cells, Silicon, Gallium compounds, Arsenides, Radiation damage, High temperature research, Alloys, *Power supplies, Phosphides, Thin films, Diffusion, Growth, Design, Resistance, Intermetallic compounds, Photons, Conductivity.

The solution-growth technique for fabricating GaAs solar cells and its limitations are discussed. The best cell made by this method had an efficiency of 2%. Preliminary work on hetero junctions and cells made from GaAs alloys is reported. The diffusion of P in GaAs is slowed down by the presence of Zn (5×10^{19} atoms/cc) by a factor of 2 at 1120°. No GaP is observed even for

P surface concentrations of $10^{22}/cm^3$. Johnson's data for the solar irradiance has been converted to yield the number of available photons outside the earth's atmosphere. The total number of photons is $6.4 \times 10^{17}/cm^2/sec$, and their average energy is 1.36 ev. The critical flux required to reduce the efficiency of Ga As solar cells by 25% was $1.8 - 3.5 \times 10^{15}$ electrons/cm^2 at bombardment energies of 800 kev. The fabrication of oxygen-free Si n on p cells is discussed. Critical fluxes for three such cells varied from 1.5×10^{15} to 2×10^{16} electrons/cm^2 at 800 kev. Absolute spectral responses fo these cells indicate damage in the base and possibly to the diffused skin. The study of bulk conductivity changes as a result of electron bombardment indicate some change in an n-type Si blank with 2.7 Ω-cm resistivity for electron energies as low as 185 kev. (Author)

PB 157 778 $3.60

Electronic Defense Labs., Mountain View, Calif.
DETECTION OF A SIGNAL IN NOISE BY A HALF-WAVE DETECTOR, by Charles A. Marsh. Rept. on Contract DA 36-039-sc-85402. 7 Feb 61, 33p. 4 refs. Technical memo. no. EDL-M323; AD-251 645.

DESCRIPTORS: Signal to noise ratio, *Detectors, *Radar receivers, Detection, *Radio receivers, *Radar signals, *Radio signals, *Half wave rectifiers, Mathematical analysis, *Video signals, Spectrographic analysis, *Noise (Radar), *Noise (Radio).

Theory and formulas are presented which compare the detected output power spectrum of a signal in noise for a square-law detector and a "linear" detector. Consideration is given to the effects of different predetection pass-band shapes and of post-detection narrow-band filtering. Four types of output signal-to-noise ratios are defined. Comparisons of output signal-to-noise ratios are made for various combinations of detectors, predetection pass-band shapes, and post-detection bandwidth filtering. Applications to receiver design are discussed. (Author)

PB 156 635 $2.60

Electronics Research Lab., U. of California, Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS, by J. R. Whinnery, C. K. Birdsall and others. Quarterly progress rept. no. 3, 1 Aug-31 Oct 60, on Contract DA 36-039-sc-85278. [1960] 27p. 14 refs. AD-253 176.

DESCRIPTORS: *Microwave amplifiers, Diodes, *Noise (Radio), *Electron tubes, Theory, Amplifiers, Electron beams, Measurement, Noise analyzers, Mathematical analysis, Tests, Oscillators, Beams.

Research continued on the study of crossed-field amplifiers with respect to gain, bandwidth, efficiency and noise properties, with emphasis on novel ideas to improve or extend performance. Measurements of noise current were made in samples across the beam in the crossed-field gun region. The results seem to check with previous velocity-distribution measurements. Measurements of total beam noise and sole current were made in the crossed-field velocity-analyzer tube. A transformation of fluctuations is presented which does not exhibit singularities as did the previous transformation. The noise figure of a crossed-field amplifier is derived. An estimate of the critical-electron parameter of the potential-minimum approximate analysis is made. Results of the calculation of noise spectra are discussed. (Author)

PB 181 080 $3.50

General Electric Co., Philadelphia, Pa.
HANDBOOK OF RELIABILITY ANALYSIS DATA FOR SYSTEMS AND COMPONENT DESIGN ENGINEERS. Apr 60, rev. 1 July 61. 223p. TRA-873-74.

DESCRIPTORS: *Electrical equipment, *Electronic equipment, Design, *Reliability, Handbooks, Failure (Mechanics), Probability.

The purpose of this handbook is to provide the design engineer with the tools and techniques to be employed for achieving the highest reliability attainable for his design responsibility. This design guidance emphasizes reliability in the early phases of development but also presents techniques and design application data to permit the analysis of certain trade-offs for optimizing the total system design.

PB 158 840 $13.50

General Electric Co., Syracuse, N. Y.
HIGH-PERVEANCE ELECTRON GUN, by Kurt Schlesinger. Final progress rept. 1 May 59-30 June 60, on Contract DA 36-039-sc-78299. 16 Sep 60, 193p. 12 refs. AD-246 112.

DESCRIPTORS: *Electron guns, Electron beams, *Electron lenses, Focusing, Cathode ray tubes, Modulation, Design

A high transconductance gun for low drive operation and aperture-controlled resolution has been developed. This gun uses focus Reflex Modulation (FRM). The FRM gun consists of a decelerating hyperbolic lens which concentrates emission from a Pierce cathode into a focal point of minute dimensions (a few mils). Since electrons come to a standstill there, a virtual point cathode has been realized. Emission from this point on is controlled by partial electron reflection. Forward emission goes through a small (.007") defining aperture prior to re-convergence and refocusing at the screen. Present performance features are: drive signal: 12 volts; screen current: 750 micro and ampere max; center resolution: up to 600 lines; high-light brightness: over 300 foot lamberts at 18,000 volts. Potential applications include: transistorized CRT displays; flat field displays, non-circular spots, projection tubes, microspot tubes, and guns for storage tubes, scan converters, and camera tubes.

PB 159 057 $15.00

Graphik-Circuits Div., Cinch Mfg. Corp., La Puente, Calif.
PRINTED CABLE FEASIBILITY STUDY, PHASE I, by L. D. Adams, J. R. Allen and others. Final rept. on Subcontract to Contract AF 04(645)56. 15 July 57, 223p. 24 refs.

DESCRIPTORS: *Electric cables, *Electric connectors, *Printed circuits, Design, Materials, Silanes, Rubber, Dielectrics, Physical properties, Tests, Specifications.

The objective of this study was to examine the feasibility of replacing conventional electrical harnesses of round wire with printed cable in the WS-107A-2. As a result of theoretical studies, fabrication of working models and laboratory testing, feasibility has been demonstrated. (Author)

PB 156 661 $3.60

Hughes Aircraft Co. [Culver City, Calif.]
HF, VHF, AND UHF POWER AMPLIFIERS AND OSCILLATORS, by J. T. Thompson. Quarterly progress rept. no. 1, 1 June-30 Aug 60, on Contract [DA 36-039-]sc-85308. [1960] 34p. 5 refs. AD-248 904.

DESCRIPTORS: *Electronic circuits, Design, *Microwave oscillators, Very high frequency, *Microwave amplifiers, Ultra high frequency, *Oscillators, *Power amplifiers, Impedance, *Transistors, Test equipment, Test methods, Measurement, High frequency, Amplifiers, Circuits.

The aims of this investigation are to characterize state-of-the-art HF, UHF, and VHF transistors and to derive methods of simplified calculation which permit the optimum design of power amplifiers and oscillators. The characterization is being carried out in order to provide data from which equivalent circuits can be derived or from which empirical functions can be obtained. High frequency parameter measurements are required to check the validity of the equivalents which are obtained by the usual methods well-known in the literature. The procedure followed in attempting to arrive at simplified expressions that can be used for determining the high frequency, high power capabilities of modern transistors is described. The main portion is concerned with measuring techniques for describing the transistors. Suitable methods adopted for future use are described in detail. Preliminary probes are made in attempting to solve the problems through pure mathematical descriptions. (Author)

AD-258 037 $4.60

Hughes Aircraft Co., Culver City, Calif.
HF, VHF, AND UHF POWER AMPLIFIERS AND OSCILLATORS, by J. T. Thompson. Quarterly progress rept. no. 2, 1 Dec 60-28 Feb 61, on Contract DA 36-039-sc-85308. May 61, 47p. 5 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: High frequency, Very high frequency, Ultra high frequency, *Power amplifiers, *Oscillators, *Microwave oscillators, Microwave amplifiers, Design, Transitors, Transitor amplifiers, Electronic circuits, Test equipment, Measurement, *Test sets, Mathematical analysis, Instrumentation.

This report describes three useful devices for measuring transistor parameters. The General Radio 1607A bridge appears to be the most useful over the greatest parameter and frequency range. The Hewlett Packard 803 admittance meter and the MC Jones directional coupler are adequately treated, considering usefulness and range extensions toward transistor measurements. To complete the investigation of instrumentation, results of an extensive survey that covered all manufacturers of high frequency measuring equipment is listed and the few instruments usable for transistor work in the HF, VHF, and UHF regions are described. Ideas are extended toward the development of a "Worksheet" a approach to the general problem of amplifier design. One segment of the "Worksheet" approach, the collector efficiency, is treated in detail both from an ideal case and an actual case that requires a numerical solution.

PB 158 947-1 $3.60

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH STABILITY RESISTORS, by William F. Stark and Robert Singer. Quarterly progress rept. no. 8, 1 Apr-30 June 58, on Contract DA 36-039-sc-72726. [1958] 36p. AD-200 581.

DESCRIPTORS: *Fixed resistors, Design, Production, Moisture, Mold washes, Specifications, Experimental data, Electrical equipment, Installation, Automatic, Helixes, Test sets, *Precision finishing, Wattmeters, *Voltage regulators, *Resistors.

The 1/4 and 1/2 watt pilot runs were put on test. The critical and high range pilot runs of 1/4 watt units presented evidence of moisture problems which were traced to the use of an improper lot of molding compound. The test data is being completed, and a third set of pilot runs on the 1/4 watt units will be made. The 1/2 watt test data to date is acceptable. The 1 watt pilot run units are being fabricated for submission to test and the 1/8 and 2 watt units must still complete preproduction testing. With the exception of the 1/2 watt subassembly machine, 1/8 watt automatic spiraller and the tray to tray transfer machine, all equipment has been installed and is in operation. The uncompleted units are now being manicured preparatory to installation. A detailed description of the spiraller and test-mark machine is included in this report. (Author) (See also PB 137 168)

PB 158 947-2 $4.60

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH STABILITY RESISTORS, by Kenneth R. Lewis. Quarterly progress rept. no. 9, 1 July-30 Sep 58, on Contract DA 36-039-sc-72726. [1958] 44p. AD-210 889.

DESCRIPTORS: *Fixed resistors, Production, Specifications, *Precision finishing, *Resistors, Electrical equipment, Installation, Test sets, Design, Mold washes, Moisture, Dielectrics, Failure (Mechanics), Ohmmeters, *Voltage regulators.

Testing was completed on the 1/8 watt preproduction run. Testing was near completion on the 2 watt preproduction run. Pilot run number 3 of 1/4 watt units was being prepared for test. The 1/2 watt pilot runs were tested and the results ready for evaluation. Preparation of the 1200-piece pilot lots for the 1 watt size continued. The tray to tray transfer fixture has been manicured, shipped and installed in the Burlington plant. A detailed description of this equipment is included. (See also PB 158 947-1)

PB 158 947-3 $2.60

International Resistance Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH STABILITY RESISTORS, by Stanley R. Kingsbury. Quarterly progress rept. no. 10, 1 Oct-31 Dec 58, on Contract DA 36-039-sc-72726. [1959] 28p. AD-215 039.

DESCRIPTORS: *Fixed resistors, *Precision finishing, *Voltage regulators, Electrical equipment, Test equipment, Specifications, Wattmeters, Moisture, Design, Thermal stresses, Fracture (Mechanics), Failure (Mechanics), Mold washes.

All pilot runs at Burlington have been completed. All have been forwarded to Philadelphia for in-plant testing. During this period, testing was completed on the pilot run of the 2 watt unit. Testing of the third run of the 1/4 watt unit is nearing completion. The pilot runs for the 1 and 2 watt units are currently in test. Moisture cycling problems were noted on the 1/8 watt (RN60) units in ranges 200K and 300K and in the 1/4 watt (RN65) units in the 500K range. It is not known whether the units are faulty or testing problems exist. Additional units have been submitted to test to determine areas causing trouble. (See also PB 158 947-2)

PB 157 591 $7.60

ITT [Federal] Labs., Nutley, N. J.
VIDEO CABLE SYSTEMS FOR TIME DIVISION MULTIPLEX EQUIPMENT, by C. Greenwald, D. Surenian and F. Kupersmith. Final engineering rept. 1 Aug 57-31 July 59, on Contract DA 36-039-sc-74891. Dec 59, 78p. AD-231 613.

DESCRIPTORS: *Pulse Cables, *Multiplex transmission, Design, *Coaxial cables, Circuits, *Communication systems.

During the study phase of this project a design plan was evolved to meet the stated objective of PPM transmission over 2-1/2 miles of CX4245 cable with a specified quality. The plan was approved and in the course of the second phase of this project two experimental models were constructed. The equipment provides facilities for transmitting up to 45 PPM channels over 1/2 to 2-1/2 miles of CX4245 cable and additional facilities for an order wire. This final engineering report presents and discusses the measured performance data for the system developed. The characteristics of the existing equipment indicate that with a proper equalizer, transmission over 3 miles of CX4245 cable, with only a slight reduction in quality, is possible. Somewhat longer lengths could be accommodated with a redesign of the receiver portion of the equipment. The entire package appears to be capable of transistorization, which will substantially reduce its bulk, weight, and power consumption. (Author)

KAPL-M-EC-6 $9.10

Knolls Atomic Power Lab., Schenectady, N. Y.
GALS: GENERALIZED ANALYSIS OF LINEAR SYSTEMS, by Donald G. Dight and James A. Warrington. Rept. on Contract W-31-109-eng-52. July 61, 112p.

PB 158 906 $2.60

Lerner, Joseph, and Son, Inc., Brooklyn, N. Y.
SEALING TECHNIQUES FOR WAVEGUIDE AND COAXIAL ROTARY JOINTS, by C. R. Kuiper. Quarterly progress rept. no. 2, 1 Oct 52-15 Feb 53, on Contract DA 36-039-sc-42559. 16 Mar 53, 28p. Rept. no. D-102-2; AD-12 108.

Portions of this report will not reproduce well.

DESCRIPTORS: *Waveguides, *Waveguide joints, *Rotary seals, *Joints, Sealing compounds, Seals, Mixtures, Rupture, Test equipment, Magnets, Pressure, Gaskets, Curve fittings, Shafts, Rotation, Carbonyl radicals, Iron compounds, Powder metallurgy, Silicones, Oils, Torque, Magnetic materials, Antiferromagnetism.

The application of the magnetic pressure sealing principle is being studied with respect to RG-48/U and RG-51/U wave-guide bands. Sealing mixtures consisting of type E (8-μ diam) and type SF (3-μ diam) carbonyl powdered irons and silicone oil were tested with a sealing area made up of a magnet, pole pieces, a spacer, O-rings, and a metal washer. Curves of the pressure-vs-mixture tests are presented. Various mixtures did not heal after rupture when a nonmagnetic washer was used. The amount of mixture ejected from the sealing area upon rupture was more noticeable when the weight ratio of powdered iron and silicone oil was 6/1 and below, or 11/1 and above. The torque required to rotate the shaft was greater when a magnetic washer was used. The rupture pressures for a stationary shaft were higher than for a rotating shaft.

PB 156 222 $3.60

Litton Systems, Inc., College Park, Md.
DIRECTION FINDER GROUP AN/TLA-9 (FORMERLY OA-(XE-1)VRD, by J. DeStefano. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-84961. 31 Dec 60, 40p. AD-252 854.

DESCRIPTORS: *Direction finding, *Antennas, *Antenna hardware, *Microwave equipment, *Parabolic antennas, *Electronic circuits, Radio equipment, Video signals, Circuits, Display systems, Electromagnetic waves, Design, Radomes, Azimuth, Servo systems

Research is concerned with design, development, and fabrication of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 kmc to 10.75 kmc. Antenna and radome assembly designs are progressing satisfactorily. Design of the video processing and display circuits was completed. Westinghouse memory tube WX4511 will be used to provide the required displays. The final design of the pedestal and servo systems is approximately 95% complete. Fabrication of the final unit was initiated. The newly assigned nomenclature for this unit is Direction Finden Group AN/TLA-9. (Author) (See also PB 155 372)

PB 155 744 $1.60

Litton Industries, Inc., Salt Lake City, Utah. COAXIAL GAS DISCHARGE DEVICE, by D. L. Letham. Quarterly progress rept. no. 2, 1 Aug-31 Oct 60, on Contract DA 36-039-sc-85128. [1960] 11p. AD-249 646.

DESCRIPTORS: *Radar duplexers, Ultra high frequency, *Gas discharges, *Discharge tubes, Transmit-receive tubes, Tests.

Cold test results of the new design using a helical inner conductor for a portion of the receiver arm are presented. Preliminary redesign of the TR tube is established. (Author) (See also PB 153 245)

PB 156 653 $1.60

Mallory, P. R., and Co., Inc., Indianapolis, Ind. SUBMINIATURE VARIABLE RESISTORS, by Howard Reeve and Robert Traas. Quarterly progress rept. no. 3, 15 Aug-15 Nov 56, on Contract DA 36-039-sc-71165. 15 Nov 56, 18p. AD-133 591.

DESCRIPTORS: *Variable resistors, Design, *Subminiature electrical equipment, Sliding contacts, Springs, Carbon resistors, Dies, Casting, Tin compounds, Oxides, Stability, Mounting brackets, Terminal blocks, Bushings, Resistors, Films, Ceramic materials, Flame spraying, Paint sprayers, Pyrolysis

This report covers research and development on subminiature variable resistors during the third quarter of the subject contract. Load life tests were completed and it was determined that, while sprayed carbon composition resistance elements were adequately stable for bushing and flat-mount resistors, they were not suited to the multiturn design. Use of pyrolytic carbon films is proposed for all three designs. Minor design changes to facilitate die casting were made in the bushing-mount resistor case. Contact spring designs are being restudied for use with pyrolytic carbon or tin oxide elements and mounting tabs and terminals of the flat-mount design were relocated to fit the 0.050-in. grid system. The net result of the changes made and proposed is expected to correct defects and result in more economical fabrication. (Author) (See also PB 156 652)

PB 156 654 $5.60

Mallory, P. R., and Co., Inc., Indianapolis, Ind. SUBMINIATURE VARIABLE RESISTORS, by Howard Reeve and Robert Traas. Final rept. 15 Feb 56-15 May 57, on Contract DA 36-039-sc-71165. [1957] 59p. 2 refs. AD-204 720.

DESCRIPTORS: *Subminiature electrical equipment, *Variable resistors, Resistors, Design, Tests.

This report covers the development of designs for 3/8 inch diameter bushing-mount and flat-mount resistors and 5/16 inch diameter multiturn resistors utilizing pyrolytic carbon resistance elements deposited on ceramic bases. Resistors, ranging from approximately 50 to 50,000 ohms in total resistance, were constructed and subjected to MIL-R-94A qualification tests. Excellent results were obtained in moisture-resistance, load-life, dielectric, temperature cycling, and insulation resistance tests. Additional research is recommended to obtain optimum performance of the pyrolytic carbon elements in all tests. (Author) (See also PB 156 652)

AD-258 345 $2.60

Microwave Associates, Inc., Burlington, Mass. INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Harold S. Maddix. Quarterly progress rept. no. 2, 1 Feb-30 Apr 61, on Contract DA 36-039-sc-87385. [1961] 25p.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Radar duplexers, *Microwave equipment, *Phase shifters, Quartz, Gas discharges, Gases, Manganese compounds, Magnesium compounds, Ferrites, Intermetallic compounds, Switching circuits, Semiconductors, Waveguides, Design, Tests, X-band.

Experimental results are presented for two different pre-TR devices utilizing quartz capsules filled with different gases. A magnesium manganese ferrite phase shifter has been operated at 3 kilowatts average power at 9500 Mc without external cooling. Insertion loss of the device was 0.12 db with cooling. Test results are given for a pill varactor limiter assembly operated at a 0.25 duty cycle. (Author)

PB 155 747 $1.60

Microwave Associates, Inc., Burlington, Mass. REFINEMENT PROGRAM ON ELECTRON TUBE S-BAND TR EST-27, by J. David Hobbs. Quarterly progress rept. no. 2, 1 Aug-31 Oct 60, on Contract DA 36-039-sc-85316. [1960] 20p. 5 refs. AD-251 101.

DESCRIPTORS: *Electron tubes, Iron compounds, *Transmit-receive tubes, S band, Design, Yttrium compounds, Manufacturing methods, Transmission lines, Radiofrequency filters, Crystal filters.

Work was concentrated on the development of an electronically tunable version of the EST-27 S-Band TR tube. The use of yttrium-iron garnet was investigated for use as an electronically tunable filter-limiter element to replace the 1B27 crystal protector. A discussion is given of the preliminary calculations as well as the experimental results obtained. The experimental results indicate that this device can be adapted for use in this application. (Author) (See also PB 154 202)

PB 156 662 $2.60

Microwave Associates, Inc., Burlington, Mass. REFINEMENT PROGRAM ON ELECTRON TUBE S-BAND TR EST-27, by Robert Tenenholtz. Quarterly progress rept. no. 3, 1 Nov 60-31 Jan 61, on Contract DA 36-039-sc-85316. [1961] 29p. 3 refs. AD-254 333.

DESCRIPTORS: *Transmit-receive tubes, S band, *Electron tubes, Yttrium compounds, Garnet, Iron compounds, Microwave equipment, Design, Tests, Manufacturing methods, Materials, Radiofrequency filters, Waveguide filters.

Research was concentrated on an electronically tunable version of the EST-27 S-band TR tube. Investigations were made on the use of yttrium-iron garnets. New structures were designed in order to improve insertion loss characteristics. Preliminary designs and tests were made on varactor loaded microwave structures. Results indicate approaches used were practical with each offering unique advantages. A comparison was made on the relative merits of each approach. (Author) (See also PB 155 747)

PB 156 068 $1.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE DESIGN OF INTENTIONALLY NONLINEAR CONTROLLERS BY THE SECOND METHOD OF LYAPUNOV, by Lawrence P. Grayson. Rept. on Contract DA 30-069-ORD-1560. 27 Dec 60, 20p. 21 refs. Research rept. PIBMRI-884-60; OOR #1538:15; AD-252 515.

DESCRIPTORS: Control systems, Mathematical analysis, *Differential equations, Stability, *Servo systems

The design of controllers for systems which are described by linear differential equations with constant coefficients is well known. Often, however, the location of the poles is not known exactly, or the poles may vary over wide ranges with increasing time. In such cases, controllers are usually designed on an experimental basis. This report presents a logical, step-by-step procedure for the design of intentionally nonlinear controllers to compensate time-varying systems, with the requirement that the overall system be asymptotically stable. The design is based upon the second method of Lyapunov. An upper bound on the response time of the overall system is also obtained. (Author)

PB 159 069 $2.60

Naval Ordnance Lab , White Oak, Md.
MEASUREMENT OF UNBALANCE IN SYNCHRO CAPACITOR UNITS, by G. H. Weiss and G. L. Beyer, Jr. 8 Dec 52, 26p. 2 refs. NAVORD rept. 2723.

Portions of this report will not reproduce well.

DESCRIPTORS: *Synchros, *Capicators, Electrostatic capacitance, Measurement, *Capacitance bridges

This report presents and compares three methods of measuring the capacitance unbalance of a synchro capacitor unit and the relationship of these methods to the requirements of capacitor specifications. The first two methods involve a direct measurement of capacitance and computation of unbalance factors, while the third, a bridge method measures the unbalance almost directly. The bridge is discussed in some detail and experimental work conducted with it is presented. The bridge is found to be a simple, quick, accurate method of making unbalance measurements on synchro capacitors. (Author)

PB 159 050 $2.60

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
A FAST-RESPONSE, PHASE-SENSITIVE DEMODULATOR AND MODULATOR CIRCUIT FOR THE IMPROVEMENT OF SERVO SYSTEMS, by Anthony F. Magaraci. 5 Oct 55, 29p. 9 refs. USL Research and development rept. no. 293.

DESCRIPTORS: Automatic, Control systems, *Servo systems, Modulators, Detectors, *Circuits, Design.

The extensive use of synchros as data-transmission and error-sensing devices in automatic control systems suggests the need for improved circuitry to decrease the complexity of carrier-system compensation and, if possible, to increase the resolution of the synchros themselves. Past methods, while affording definite improvement in carrier-system performance, have not proved completely satisfactory because they inevitably introduce an unwanted time constant into the system. This added time constant often limits the degree of improvement that can be provided in the system. An electromechanical circuit that is a satisfactory solution to the dual problem of carrier-system compensation and synchro resolution is described. The circuit is essentially a fast-response demodulator and modulator unit that is simple to adjust and reliable in its application. Through its use, carrier systems can achieve a degree of performance hitherto unattainable.
(Author)

PB 156 660 $23.50

New York U., N. Y.
PROCEEDINGS OF THE SYMPOSIUM ON HYDROGEN THYRATRONS AND MODULATORS [NO. 6] HELD AT THE HEXAGON, FORT MONMOUTH, NEW JERSEY ON 17, 18, AND 19 MAY 1960. Rept. on Contract DA 36-039-sc-85307. [1960] 460p. 43 refs. AD-254 102.

DESCRIPTORS: Solid state physics, Hydrogen, *Thyratrons, *Modulators, *Symposia, Design, *Electron tubes, Electronic equipment, Switching circuits, *Pulse generators, *Rectifiers, Modulator tubes.

Contents:
Hydrogen thyratrons (5 papers)
Modulator techniques and ignitrons (6 papers)
Modulator devices (6 papers)
Auxiliary devices and hard-tube modulators (6 papers)
Modulator techniques and general discussion (5 papers)
Modulator techniques (5 papers)

PB 158 930 $7.60

New York U. Coll. of Engineering, N. Y.
IMPROVED AIRBORNE DIRECTION FINDER, by John J. Stalder. Final rept. for 7 May 58-31 July 59 on Contract DA 36-039-sc-75074. [1959] 74p. 5 refs. AD-229 914.

DESCRIPTORS: Audiofrequency, *Direction finding, Airborne, Design, Tests.

This program was conducted in order to evaluate the performance characteristics of airborne direction finders employing modulation identification procedures at audio frequency. The loop antenna's drive signal was derived from identifying modulation impressed upon the "desired" transmission. Three circuits employing audio coherent detection and limited range automatic phase control loops were evaluated. Two circuits employing audio band pass filtering followed by envelope detection were also evaluated. It was shown that the non-coherent, as well as the coherent, audio identifying circuits were capable of providing proper ADF performance in the absence of interference. Both circuit types were capable of reducing the interference induced bearing errors which would result with the conventional ADF circuits. The non-coherent circuits performed somewhat better than the coherent circuits, although they were not generally capable of reducing interference errors to an acceptable level.

PB 155 249 $2.60

Philco Corp., Lansdale, Pa.
RESEARCH AND DEVELOPMENT OF A 1000 MC GERMANIUM AMPLIFIER TRANSISTOR, by R. L. Luce and P. E. Deysher. Quarterly rept. no. 1, 1 July-30 Sep 60, on Contract DA 36-039-sc-85367. [1960] 30p. Philco no. R111.1; AD-248 442.

DESCRIPTORS: *Transistor amplifiers, Design, Transistors, Germanium, Stability, Tests, Electrical properties, Amplifiers.

The first three months of work have been completed in the development of the 1000 mc Germanium Amplifier Transistor. During this period a procedure has been devised for fabrication of the coaxial transistor to meet specifications set forth in Signal Corps Specification SCL-7002/93. The fabrication procedure, problems encountered in fabrication, and electrical parameters tested are described. Emitter shorting and non-flat etch pits were the main problems encountered in fabrication. These problems have been solved or corrected to a large extent. (Author)

PB 159 002 $1.10

Pritikin, Nathan.
I[NDUSTRIAL] P[REPAREDNESS] S[TUDY] FOR PRECISION HIGH STABILITY RESISTORS, by Nathan Pritikin. Quarterly progress rept. no. 2, 1 Oct-31 Dec 56, on Contracts DA 36-039-sc-72722 and DA 36-039-sc-72723. 15 Jan 57, 8p.

DESCRIPTORS: *Glass resistors, Resistors, Design, Stability.

PB 158 927 $5.60

Purdue U. School of Electrical Engineering, Lafayette, Ind.
A STUDY OF DIGITAL ADAPTIVE CONTROL SYSTEMS, by J. T. Tou, P. D. Joseph, and J. B. Lewis. Technical rept. no. 1 on Contract Nonr-1100(18). Sep 60, 58p. 41 refs. PRF 2327; AD-245 097.

DESCRIPTORS: Control systems, *Servo systems, *Digital computers, Circuits, Design, Synthesis.

A study was made of a digital adaptive system which automatically identifies the open loop poles and zeros of a linear time-varying plant transfer function, and then automatically designs a linear digital compensator to control the plant in some optimum manner. The identification procedure is capable of converging to the plant parameters to within a specified accuracy even in the presence of random disturbances at the output. An application of the identification procedure was investigated for a 3 parameter plant where the compensator was designed for dead-beat response to a step input. The adaptive system was simulated on a digital computer, and the ability of approximate relationships to predict identification accuracy was verified. Performance of the adaptive system for variations of a plant parameter and for certain initial conditions was also investigated. (Author)

PB 155 843 $6.60

Raytheon Co., Burlington, Mass.
DEVELOPMENT OF A 10-WATT X-BAND TRAVELING-WAVE TUBE, by B. Titlebaum and K. Falor. Final engineering rept. 16 July 57-28 Sep 60, on QKW669, Contract DA 36-039-sc-74819. 28 Sep 60, 62p. 7 refs. AD-251 462.

DESCRIPTORS: *Traveling wave tubes, X band, Superhigh frequency, Electron guns, Magnets, *Radio communication systems, Focusing, Electron beams, Helixes, Communication systems.

A 10 watt traveling-wave-tube covering the 7.125-8.5 kmc/s frequency range has been developed. The original design as specified was worked on to the point where a first tube was ready for construction. It was then decided that the 1000 gauss focusing field would require an excessively heavy magnet. A complete electrical and mechanical redesign followed, based on use of a 600 gauss cylindrical magnet weighing less than ten pounds. Major problems which were solved include obtaining saturated output power, focusing of the beam, rf matching and leakage, and construction of the helix assembly. One tube was completed and tested. (Author)

PB 158 945 $14.00

Raytheon Co., Waltham, Mass.
PLATINOTRON RESEARCH PROGRAM, by William R. Zettler, G. E. Dombrowski, and Thomas E. Ruden. Final engineering rept. for 15 June 56-15 Oct 58 on Contract DA 36-039-sc-71173. [1958] 206p. 23 refs. AD-225 503.

DESCRIPTORS: *Magnetrons, Design, Microwave equipment, Mathematical analysis, Analog computers, Mathematical computer data, Particle trajectories, Electronic circuits, Microwave networks.

It has been the purpose of the present program to investigate in a number of ways a few of the basic characteristics of the platinotron, in order that the obvious advantages of the class might be more fully understood and exploited. One method of attack upon the problem has been to establish an analog model of the platinotron, and by means of computer techniques determine some of the characteristics of electron trajectories in the tube, from which operating principles might be inferred.

A second line of attack has been the development of an external- circuit platinotron, upon which various micro wave circuits with differing propagation characteristics could be affixed, to determine the effects upon tube performance of these characteristics. The third approach to this program has been studies of a theoretical nature contributed by members of the departmental theory staff and by consultants expert in the field of microwave tubes. Two separate investigations were made on the question of reverse traveling power in the Amplitron, and while the models chosen differed, and the results not in complete agreement, both studies indicated that the reverse power should be negligible, a phenomenon that had previously been observed. (Author)

PB 157 717 $4.60

RCA Defense Electronic Products, Camden, N. J. STUDY OF SEMICONDUCTOR DEVICES AS FUNCTIONAL REPLACEMENTS FOR ELECTRON TUBE RECTIFIERS, by M. D. Burke. Final rept. 16 June 58-15 Oct 59, on Task 417, Standardization Studies, Electronic Component Parts and Materials, Contract DA 36-039-sc-66470. 1959, 44p. 6 refs. AD-231 720.

DESCRIPTORS: Semiconductors, *Electron tubes, *Rectifiers, Silicon, *Diodes, Reliability, Standardization, Specifications, Cathode ray tubes, Military equipment.

Research was conducted to establish appropriate specifications for semiconductor devices used in high voltage rectification applications such that they may be substituted for electron tube types 1B3, 1Z2, and 2X2A in new equipment designs. A secondary purpose is to evaluate the improvement in reliability over the tubes with a life test of the devices. From the results of this study, it is clearly evident that the application of silicon series string rectifiers to military cathode ray tube applications is quite within the state of the art, whether the source of supply voltage be at 400 cps, 40 K cps, or a flyback circuit. Efficiencies approaching the theoretical maxima were readily attained. Since the silicon rectifiers tested were virtually unaffected by the 2000 hour $25 \pm 5^{\circ}$ C operating life test, no specific failure rate can be established. Indications are that performance is markedly superior to tubes for similar applications operated under equivalent conditions.

PB 155 945 $7.60

RCA Defense Electronics Products, New York. BROADBAND S-BAND REACTANCE AMPLIFIER, by H. Boyet, B. Bossard, and R. Pettai. Quarterly progress rept. no. 1, 1 July-30 Sep 60, on Contract DA 36-039-sc-85058. 15 Dec 60, 74p. AD-248 682.

DESCRIPTORS: *Microwave amplifiers, *Diodes, *Amplifiers, Broadband, Semiconductors, *Traveling wave tubes, Microwave networks, S-band, Design.

Research is concerned with developing a low noise broadband S-band reactance amplifier. Two approaches are being employed: filter-type parametric upconverters using a single diode and traveling wave parametric upconverter. Both approaches are being simultaneously considered. This program is an extension of the state of the art in which design goals entail 13 db minimum gain, 2 kmc to 4 kmc minimum bandwidth, and an amplifier noise figure less than 2 db. Most of the efforts on the octave bandwidth S-band parametric amplifier were directed towards the filter-type single diode parametric upconverter approach. The basic problem in achieving broadband operation is compensation of the gain-frequency variation of the single diode amplifier by synthesizing input and output networks having prescribed frequency dependencies. Two possible modes of operation were considered: shunt and series loading. Using the synthesis techniques mentioned, it is theoretically possible to achieve parametric amplification in the 2 to 4 kmc region with a 3 db bandwidth approaching 1000 mc. Most of the theoretical work on the program is complete. (Author)

PB 157 292 $5.60

RCA Defense Electronic Products, New York. BROADBAND S-BAND REACTANCE AMPLIFIER, by R. Pettai, B. Bossard, and H. Boyet. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-85058. 1 Mar 61, 58p. RCA rept. no. CR-61-419B; AD-254 177.

DESCRIPTORS: S-band, *Microwave amplifiers, Amplifiers, Broadband, *Diodes, *Traveling wave tubes, Design, Theory, Measurement, Microwave networks, Synthesis, Impedance.

Efforts were concentrated on synthesis techniques applicable to realization of signal and idler networks that will compensate for the frequency sensitive terms in the paramp gain equation. One set of compensatory networks (not necessarily optimum) provides a theoretical peak gain of 8.3 db and a theoretical 3 db bandwidth of 700 mc for upconverter operation. Alternate approaches such as circulator coupled paramps, dual paramps, and traveling wave paramps were considered. Measurements of idler load impedance were made using an existing parametric upconverter. (Author) (See also PB 155 945)

AD-257 297 $3.60

RCA Defense Electronic Products, New York. BROADBAND S-BAND REACTANCE AMPLIFIER, by R. Pettai and B. Bossard. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85058. 1 May 61, 32p. Rept. no. 61-419-1C.

This report released to the public by the cognizant military agency 7 Dec 61.

DESCRIPTORS: S-band, *Microwave amplifiers, Amplifiers, Broadband, *Diodes, *Semiconductors, Electronic circuits, Microwave networks, Waveguides, Radiofrequency filters, Low pass filters, Coupling circuits, Design, Theory, Mathematical analysis, Tests.

The first experimental diode mount and the associated circuit elements of the parametric upconverter have been designed and fabricated. A detailed description and engineering sketches of the structure are included in this report. Preliminary tests of the individual components have begun and as they prove satisfactory, the whole upconverter will be assembled and tested. The circulator coupled parametric amplifier has been analyzed in greater detail. The use of appropriate networks in the input and in the idler

circuits enables a bandwidth of 495 mc at a peak gain of 11.2 db to be achieved. This result is theoretical and it is not considered the optimum. Several experimental diode mounts in Microstrip line have been constructed, but their VSWR has been found excessive. (Author)

PB 154 197 $4.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
NONLINEAR PROPERTIES OF FM LIMITERS, by Luiz C. Bahiana. Master's thesis. Rept. on Contract DA 36-039-78108. 29 May 59, 50p. 10 refs. Technical rept. 350; AD-228 014.

DESCRIPTORS: Frequency modulation, *Limiters, *Diodes, Tuned circuits, Circuits, Mathematical analysis, Tests, Theory.

A resistive model for the double-diode amplitude limiter is used in an investigation of the characteristics of a double-diode tuned limiter. It is assumed that the tuned circuit can be replaced by an equivalent resistance (equal to the impedance of the tuned circuit at the given driving frequency). The crystal diodes are assumed to follow a square-law volt-ampere dependence when they are conducting. A limiter coefficient K_L is suggested and shown to be a convenient parameter for defining the limiter performance. The characteristics calculated on the basis of this theory agree, within a reasonable degree of approximation, with available experimental data. To solve the limiter problem with the tuned circuit shunted by ideal diodes, a breakpoint analysis that results in a set of transcendental equations, called the limiter equations, is carried out. In view of the complexity of such equations, a numerical solution is worked out. Subsequent correlation shows that the resistive model is a good approximation for amplitudes, but cannot account for a variation of phase with amplitude that is indicated by the solution of the limiter equations. A revised model is suggested to take care of the phase distortion. The predictions of this model are shown to be qualitatively correct. (Author)

PB 157 588 $8.10

Roanwell Corp. [Brooklyn] N. Y.
DYNAMIC MICROPHONES M-80( )/GR AND M-81( )/GR, by Gaston Marchand, George Cagen and others. Final rept. 27 June 57-26 Oct 59, on Contract DA 36-039-sc-66399. [1959] 86p. AD-232 373.

DESCRIPTORS: *Microphones, Design, Circuits, Materials, Mechanical properties, Tests, *Communication equipment

The development is presented of two hand-held microphones, M-80( )/GR and M-81( )/GR. Although the M-80( )/GR is a differential noise canceling microphone and the M-81( )/GR is a direct pressure microphone, both units are designed to use the same microphone element. In order to achieve noise cancelation, the M-80( )/GR has 2 pairs of noise canceling ports located on the side of the case. The M-81( )/GR case does not have these ports and the chamber behind the element is used to acoustically load the diaphragm. In all other respects the two microphones are identical. The microphones are enclosed in cases made of high impact phenolic CFI-10 with rubber boot covered switch and microphone elements for maximum protection against shock, moisture and dirt. The microphone element is constructed with a newly developed stainless steel diaphragm which assures maximum protection against blast damage. The magnet and yoke are of particularly sturdy design to provide the high mechanical stability necessary for compliance with the technical requirements. (Author)

PB 155 450 $2.60

Rome Air Development Center, Griffiss AFB, N. Y.
ON THE OPTIMUM RANGE RESOLUTION OF RADAR SIGNALS IN NOISE, by N. J. Nilsson. Feb 61, 28p. 11 refs. RADC-TR-61-19; AD-253 493.

DESCRIPTORS: *Radar signals, *Radar reflections, Radar echo areas, Mathematical analysis, *Radar targets, Detection, Signal to noise ratio, Density, Range finding, Identification, *Radar images, Errors, *Radar, Target recognition, Range.

Optimum radar resolution is recognized to be a problem in distinguishing between different possible target configurations. Radar reception systems which perform optimum range resolution are then designed using the principles of statistical decision theory. In particular, the design of the optimum resolution system is carried out for a squared-error loss function, modified to provide extra penalties for wrong guesses about the number of targets present. Such a system is capable of simultaneously deciding the number of targets present, their spatial positions (ranges) and their relative amplitudes. The analysis also includes the design of an optimum device for the resolution of distributed (clutter-like) targets. (Author)

PB 155 899 $1.60

Rome Air Development Center, Griffiss AFB, N. Y.
ON THE SURVIVABILITY OF COMMUNICATIONS SYSTEMS, by Todd G. Williams. Mar 61, 17p. 3 refs. RADC-TN-61-48; AD-254 878.

DESCRIPTORS: *Communication systems, Vulnerability, Survival, Probability, *Damage control, Ammunition damage, Costs, Bombs, *Radio communication systems, Design, Mathematical analysis.

The problem of designing communication networks that have a specified probability of survival when subjected to random bombardment is considered. The nature of the techniques of redundancy, hardening and dispersal is discussed and the condition for determining the least cost mix is stated. A general solution is obtained for the case of a class of maximum networks of the Shannon-Moore type. (Author)

SCR-430 $0.50

Sandia Corp., Albuquerque, N. Mex.
THE EFFECT OF RAIN CLOUDS ON THE DESIGN OF RADAR ALTIMETERS, by C. H. Bidwell. Oct 61, 20p.

SCTM-164-61-(14) $0.50

Sandia Corp., Albuquerque, N. Mex.
HANDY FORMULAS CONCERNING NARROWBAND DELIVERY OF ENERGY STORED IN COILS OR CAPACITORS, by C. S. Williams, Jr. Sep 61, 25p.

SCTM-207-61(24) $1.60

Sandia Corp., Albuquerque, N. Mex.
MEASUREMENT OF AIR FLOW BY MEANS OF THERMISTORS, by David R. Kendall. Aug 61, 16p.

SCR-447 $1.10

Sandia Corp., Albuquerque, N. Mex.
RIGID FOAMS AS VERSATILE PROTECTION FOR COMPONENTRY AGAINST HIGH "G" SHOCK, by B. H. Anderson, R. J. Hart, and J. Jacobs. Oct 61, 9p.

AD-259 370 $5.60

Sperry Electronic Tube Div., Sperry Rand Corp., Gainesville, Fla.
MANUFACTURE OF PULSED TRAVELING WAVE TUBE. Final progress rept. for 29 Apr-30 Nov 60 on Contract DA 36-039-sc-78334. May 61, 52p. 3 refs. Pub. no. NJ 4105-0045.

This report released by the cognizant military agency for sale to the public

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Manufacturing methods, Microwave equipment, Ultra high frequency, Production, Design, Tests, Solenoids, *Radiofrequency generators, Radiofrequency power, *Power amplifiers, *Microwave amplifiers, Amplifiers

The program objective was to provide a chain of traveling wave tube amplifiers for use in the 300 to 600 mc frequency range. Six STP-256 and STP-108 traveling wave tubes and one STP-108 focusing solenoid were designed and manufactured. The STP-256, developing one watt RF power, is capable of driving the STP-108 which develops 200 watts minimum peak power output in the 300 to 600 mc frequency range. A pilot line capable of producing 20 high power and 30 low power tubes per month was established. (Author)

AD-259 542 $3.60

Sperry Microwave Electronics Co., Clearwater, Fla.
DEVELOPMENT OF C-BAND BEACON FERRITE DUPLEXER, by J. Clark. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85330. May 61, 36p. 14 refs. Technical rept. no. S. J.-220-0029-3.

This report released by the cognizant military agency for sale to the public

DESCRIPTORS: *Miniature electronic equipment, G-band, *Radar duplexers, Limiters, Transmission lines, Electric connectors, Microwave equipment, Design, *Radar beacons, Ferrites.

Results obtained with the gyromagnetic coupling limiter indicated that this device will operate satisfactorily with low loss and with only a change in the magnitude of the biasing field required for tuning. A combination of three components - the gyromagnetic coupling limiter, a high power four port circulator, and a high power coaxial load - was chosen as the most suitable configuration for the C-band beacon duplexer. Configuration including a coaxial subsidiary resonance limiter and a miniaturized strip transmission line isolator discarded because of the relatively high insertion loss that existed in these components. Careful study was given to the high power problem and it was concluded that the modified type N connector may yield exceptional high power performance. (Author)

PB 155 846 $4.60

Sperry Microwave Electronics Co., Clearwater, Fla.
DEVELOPMENT OF C-BAND BEACON FERRITE DUPLEXER. PHASE II, by J. Clark and W. Heithaus. Quarterly progress rept. no. 1, 30 June-30 Sep 60, on Contract DA 36-039-sc-85330. Oct 60, 49p. 8 refs. Rept. no. SJ-220-0029-1; AD-252 139.

DESCRIPTORS: *Miniature electronic equipment, *Radar duplexers, *Radar beacons, C band, S band, X band, *Transmission lines, *Limiters, Microwave equipment, Ferrites, Design.

Efforts concern the design and development of miniaturized C-Band beacon ferrite duplexers incorporating limiting and preselection functions, and meeting stringent mechanical and environmental requirements. Present work was primarily directed to the evaluation of a parametric limiter and a gyro magnetic coupling limiter. A design for a tunable high power circulator expected to be suitable for this program was generated. Limiting was obtained with the parametric limiter. A test structure for the gyromagnetic coupling limiter was built. (Author)

PB 157 371 $8.10

Stanford Electronics Labs., Stanford U., Calif.
ELECTRON DEVICES RESEARCH. Consolidated quarterly status rept. no. 15, 1 July-30 Sep 60, on Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 19(604)5480, Nonr-225(40) and Nonr-225(24). [1960] 82p. 14 refs. AD-248 378.

DESCRIPTORS: Microwave equipment, Ferrites, Backward-wave amplifiers, Magnetrons, Backward-wave oscillators, Oscillators, Traveling wave tubes, Klystrons, Microwave amplifiers, Electron guns, *Electronic equipment, *Electron tubes, Plasma physics.

Contents:
Current flow in plasmas; Depressed collector; High-voltage wideband traveling-wave amplifiers; Stationary nonequilibrium plasmas; Backward-wave amplifier; Power limitations in wideband traveling-wave tubes; Harmonic pumping in maser materials; Broadband maser amplifiers; Theoretical studies of solid-state masers; General microwave device studies; Transverse-wave electron-beam tubes; Solid state masers; Superregeneration in parametric amplifiers; Investigation of noise in electron guns; Parametric amplifiers; Microwave phonons in solids; General traveling-wave and

backward-wave oscillator studies; Electron beam parametric amplifier; Noise studies; Hollow-beam electrostatic focusing; Plasma backward-wave parametric amplifier; Construction techniques for electron devices; Ferrimagnetic filters and resonators; Study of high-power hollow-beam traveling-wave amplifiers. (See also PB 150 655)

PB 152 461 $3.60

Stanford Electronics Labs., Stanford U., Calif.
AN EXPERIMENTAL INVESTIGATION OF THE ENERGY LEVELS OF COPPER AND GOLD IN SILICON AND A SEARCH FOR ACCOMPANYING IMPURITY BAND CONDUCTION, by R. E. Aitchison. Rept. on Contract AF 33(616)6207. 31 Aug 60, 32p. 18 refs. Technical rept. no. 211-2; AD-244 171.

DESCRIPTORS: *Silicon, Impurities, Copper, Gold, Semiconductors, Conductivity, Diffusion, Heat treatment, Electrical properties, Electrical conductance, Energy.

The energy levels due to the incorporation of copper and gold in silicon were investigated experimentally with the primary aim of determining whether these elements could be incorporated in sufficient electrically active concentration in the silicon lattice to produce impurity band conduction. The impurities were introduced by diffusion at a high temperature and rapid quenching. Measurements of the conductivity and Hall mobility of a number of samples containing copper confirm that only a small fraction of the impurity is electrically active. Although for gold the maximum electrically active impurity concentration produced was found to be higher and approached 10^{16} atoms per cm^3, at this concentration there was no evidence of impurity band conduction. Other methods of introducing deep impurity levels in silicon in high concentrations are considered, and it is concluded that levels due to vacancies produced by bombardment with high-voltage electrons show the best promise of producing concentrations greater than 10^{16} per cm^3. (Author)

PB 157 372 $8.60

Stanford Electronics Labs., Stanford U., Calif.
PARAMETRIC PUMPING OF SPACE-CHARGE WAVES, by J. E. Monson. Rept. on Contract Nonr-225(40). 27 Oct 60, 92p. 30 refs. Technical rept. no. 317-1; AD-246 830.

DESCRIPTORS: *Space charges, *Microwave amplifiers, Electron beams, Design, Analysis, Electronic equipment, *Traveling wave tubes.

Parametric pumping of space-charge waves is investigated in some detail because of its promise of low-noise amplification. Attention is concentrated upon the pumping of longitudinal space-charge waves in a thick electron beam by means of pump-frequency electric fields which propagate along a pump circuit in close proximity to the beam. A simple theory of parametric pumping is presented from two viewpoints. An experimental device exhibited parametric amplification of the fast space-charge wave at 2000 Mc. An analysis is presented for a fast-space-charge-wave amplifier in which a circuit mode is present at the idler frequency. (Author)

PB 158 948 $5.60

Stanford Research Inst., Menlo Park, Calif.
DESIGN CRITERIA FOR MICROWAVE FILTERS AND COUPLING STRUCTURES, by E. M. T. Jones, S. B. Cohn, and J. K. Shimizu. Technical rept. no. 1, 1 Oct-1 Dec 57, on Contract DA 36-039-sc-74862, continuation of Contracts DA 36-039-sc-64625 and DA 36-039-sc-63232. Feb 58, 51p. 7 refs. SRI Proj. 2326; AD-200 012.

DESCRIPTORS: *Radiofrequency filters, Design, *Microwave equipment, Microwave oscillators, Frequency multipliers, Harmonic analyzers, Attenuation, Band-pass filters, Phase shifters, Transmission lines, Waveguide couplers, Coupling circuits, Electronic equipment, Couplings.

A discussion is presented of design criteria for high-power microwave filters that will pass the fundamental-frequency energy of a high-power microwave oscillator and at the same time strongly attenuate its harmonics and spurious "moding" energy. Various techniques are described for dissipating the spurious energy reflected by these filters. A new type of wide-band strip-line Magic-T is described here that has good theoretical performance over a two-to-one frequency range. This planar device contains 2 lengths of strip-line and 2 dual coupled-strip-line band-pass filters whose image phase shifts differ by 180^0 at all frequencies. Performance calculations are presented for 5 different Magic-T's. The measured performance is presented of strip-line T-junctions that were modified so that the turns ratio of the equivalent transformer in the shunt arm is more nearly constant over a wide frequency range than it is in an uncompensated junction. In all junctions studied it is found that when the frequency sensitivity of the transformer turns ratio is decreased, the magnitude and frequency sensitivity of the junction susceptance is increased. (Author)

PB 158 949 $6.60

Stanford Research Inst., Menlo Park, Calif.
DESIGN CRITERIA FOR MICROWAVE FILTERS AND COUPLING STRUCTURES, by S. B. Cohn, C. Flammer and others. Technical rept. 2, 1 Jan-31 Mar 58, on Contract DA 36-039-sc-74862.

DESCRIPTORS: *Radiofrequency filters, Design, *Microwave equipment, Impedance, *Transmission lines, Waveguide couplers, Waveguide filters, Waveguide slots, Ferrites, Perturbation theory, Cavity resonators, Couplings.

Formulas are presented for the even-and odd-mode characteristic impedance of coupled strip transmission lines having cross-section shapes that are particularly useful in the construction of wide-band coupled-strip-line filters and 3-db directional couplers. The cross-section shapes considered are broadside-coupled strips parallel to the ground planes, and broadside-coupled strips perpendicular to the ground planes. The design and measured performance is described of two wide-band corrugated waveguide filters with longitudinal slots. One of these filters has a pass band extending from 10-15.5 kMc and a stop band extending from 20-47 kMc. 15-21 kMc and a stop band extending from 30-63 kMc. The perturbation formulas for evaluating the resonant frequency

and unloaded Q of cavities containing small amounts of ferrite are derived. These formulas are used to evaluate the tuning capabilities of a rectangular cavity containing either a ferrite sphere or thin slabs of ferrite placed against opposite cavity walls. A directional filter is proposed that then can be magnetically tuned over a wide frequency band. This filter is composed of a number of rectangular ferrite-loaded cavities, each of which can be tuned over a limited frequency band. (Author)

PB 158 933 $8.10

Stanford Research Inst., Menlo Park, Calif.
DESIGN CRITERIA FOR MICROWAVE FILTERS AND COUPLING STRUCTURES, by S. B. Cohn, W. J. Getsinger and others. Technical rept. 3, 1 Apr-1 July 58, on Contract DA 36-039-sc-74862. Aug 58, 85p. 18 refs SRI Proj. 2326; AD-205 819.

DESCRIPTORS: *Radiofrequency filters, Design, *Microwave equipment, *Transmission lines, Band-pass filters, Coupling circuits, Cavity resonators, Ferrites, Resonance, Ferromagnetism, Couplings, Waveguide couplers, Waveguides, Electronic equipment, Air, Solids, Dielectrics Materials, Phase shifters, Magnetic fields, Equations.

A method has been devised for computing the amount of power dissipation that will result from any particular combination of design-parameters in a multiple-resonator bandpass microwave filter. This method can also be used for determining what design parameters will provide the true minimum-possible center-frequency loss. Equivalent-circuit data are given for sixteen symmetrical strip-line T-junctions, whose through arms and stub arms cover all possible combinations of 35, 50, 70, and 100 ohms. It is shown how the susceptance element in the equivalent circuit may be matched out in certain cases by adding a small open-circuited stub to the junction. The technique presented for the design of forward-coupling hybrid-junctions is applied to the design of a strip-line hybrid composed of a pair of flat conducting strips separated from each other by an air gap, and from parallel ground planes by a solid dielectric. Measurements made on the hybrid show that over a 17.5 percent band the power division is flat to within 1/4 db, VSWR is less than 1.50 and isolation is 13:db or better. Two techniques are described for magnetically tuning ferrite loaded filters. (See also PB 158 949)

AD-258 145 $3.60

Sylvania Electric Products, Inc., Woburn, Mass.
MICROMINIATURIZED PACKAGING OF 2N384 AND 2N697, by L. Epstein, C. Lawrenson, and J. McManus. Quarterly rept. no. 2, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85377. [1961] 36p.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Transistors, Germanium, Silicon, Packaging, *Subminiature electronic equipment, Design, Reliability, Manufacturing methods, Production. Tests, Life expectancy

A lot of germanium alloy devices similar to 2N384's were enclosed in a microminiature package. The samples passed all tests except 500 G 1 millisecond shock. Work was continued on the 0.265 in. -diam package. Weld yields after header mounting were consistently over 90% and averaged almost 95%. A lot of silicon mesa devices were also mounted in microminiature packages and representative samples were taken for evaluation.

PB 155 449 $6.60

Syracuse U., N. Y.
ELEMENTS OF ENCODING, by F. M. Reza. Rept. on Contract AF 30(602)2018. Feb 61, 62p. 14 refs. RADC-TN-61-3; AD-253 442.

DESCRIPTORS: *Coding, *Cryptography, Probability, Information theory, Standards, Communication systems, Mathematical logic, Errors, Corrections.

The common terms of encoding such as source, efficiency, redundancy and decipherability are defined in this report. A criterion is given for uniquely decipherable codes. Shannon-Fano, Huffman, Gilbert-Moore, Elias and Hamming error correcting codes are discussed. The fundamental theorem of information theory is proved for noiseless channels and for binary symmetric channels. Algebraic group codes are not considered in this report. (Author)

PB 156 633 $2.60

Tung-Sol Electric, Inc., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT IN UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION, by B. G. Firth, Warren C. Johnson, and Donald W. Mayer. Quarterly rept. no. 4, 4 Oct 60-3 Jan 61, on Contract DA 36-039-sc-85120. 3 Jan 61, 25p. AD-253 349

DESCRIPTORS: *Oxide cathodes, Coatings, Magnesium compounds, Oxides, Electrostatics, Design, *Cold cathode tubes, *Cathodes (Electron tubes), *Diodes, Field emission, Thermionic emission, Photoemission.

Progress is reported on studies of electrostatic smoked MgO coated cathodes at low relative humidity, coating densities, low work function interface cold cathodes, life tests, electron velocity distribution, noise and apparent inductance. Spray coated cathodes are included. Electron velocity distribution measurements have been improved. Vacuum evaporated thin layers of Mg oxidized and vacuum processed are reported. A study is being made of the role played by heating the MgO cathode in low pressure air and then in vacuum to activate it. The air treatment is found to significantly affect the MgO rather than the interface. (Author) (See also PB 156 632)

PB 158 926 $4.60

United States Electric Mfg. Corp., New York.
DEVELOPMENT OF HIGH RATE LE CLANCHE WAFER CELLS, by Maurice Lang. Progress rept. no. 1, 1 Dec 56-28 Feb 57, on Contract DA 36-039-sc-73107. [1957] 44p. AD-138 155.

DESCRIPTORS: Battery separators, Electrolytes, Design, *Dry cells, Reliability, Subminiature electrical equipment, Temperature, Vibration, Shock, Voltage dividers, Oxidation inhibitors, Corrosion inhibition, Zinc coatings, Storage batteries.

The aim is to develop a wafer cell battery which will be rugged, reliable and have long shelf life. The unit should be so designed as to permit assembly techniques for rapid and economical production. It should be suitable for "A" and "B" batteries for high and low drain applications. Data from completed studies of inhibitors, separators and electrolytes are reported. 9 volt batteries for use as "A" units were designed and tested.

Ordnance, Missiles, and Satellite Vehicles

PB 159 005

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
DERIVATION AND CALCULATION OF INITIAL VALUES OF MOON-HITTING TRAJECTORIES, by Harry Ruppe and Warren Straly. 30 May 58, 32p. 3 refs. Rept. no. DSP-TM-3-58.

DESCRIPTORS: *Satellite vehicle trajectories, Determination, *Lunar probes.

This report was written to satisfy the need for a rapid and simple method of calculating the initial data for earth - moon flight paths. If the time and date of impact on the moon, flight time, and launching place are known, this method enables one to find the approximate launching time, injection angle and azimuth. The report is intended as an aid in computing such values without the use of an electronic computer. (Author)

PB 159 051 $4.60

Army [Signal Missile Support] Agency, White Sands [Missile Range] N. Mex.
THE EFFECT OF WIND AND TOWER TILT ON UNGUIDED ROCKETS, by Henry Rachele. Progress rept. no. 6 (rev.) on Wind Effect on the Aerobee. Feb 58, 47p. 2 refs.

DESCRIPTORS: *Sounding rockets, Rockets, Meteorology, Wind, Launching sites, Towers, Geophysics, Mathematical prediction

Concern was shown for the method of evaluating the effect of the wind and the tower tilt for the prediction of impact points after comparing actual impacts with the predicted impact locations. An investigation revealed a possible error in the interpretation of the sign convention intended in the Lewis method. The sign convention proposed is not identical with the original, but it is believed that it is more readily adaptable to the problem at hand. Included is a brief discussion on the use of the conservation of angular momentum during the vacuum trajectory. A sample calculation for Aerobee NRL-21 is included as an example of the results of using the method outlined. (Author)

PB 159 001 $5.60

Bureau of [Naval Weapons] Washington, D. C.
SAFETY PRINCIPLES FOR OPERATIONS INVOLVING ELECTRO-EXPLOSIVE DEVICES. 13 July 59, 59p. 22 refs. NAVORD OD-10773

DESCRIPTORS: *Explosives, Detonation, *Electric detonators, *Electric bridges, *Transducers, *Exploder mechanisms, Operation, Safety, Personnel, Training, Handbooks

Contents:
Nature of electro-explosive devices
Causes of unintentional initiations
Prevention of unintentional initiations
Training the operator
Nature of some problems that have been met under various conditions of operation
Coping with problems met in the production line
Explosive train testing

PB 155 248 $2.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STABILITY STUDIES OF QUARTZ CRYSTALS FOR SATELLITES, by R. B. Belser and W. H. Hicklin. Quarterly rept. no. 1, 10 June-1 Oct 60, on Contract DA 36-039-sc-85363. [1960] 29p. 1 ref. ARPA Order no. 54-60; AD-249 558.

DESCRIPTORS: *Quartz resonators, Quartz crystals, Very high frequency, *Satellite vehicles, Instrumentation, Stability, Aluminum, Silver, Frequency, Measurement.

Efforts are being made to develop AT-Cut quartz resonators of 100 mc frequency with stabilities suitable for operation in satellites or other space vehicles. Initial target stabilities are 0.3 ppm per year and ultimate desired stabilities are 0.1 ppm per year. These are to be maintained in spite of temperature cycling over the range 0 to 60 C one to several times per day and in spite of exposure to radiation typical of that of the Van Allen radiation belt. Thirty-seven 100 mc resonators were fabricated. These consisted of 18 fifth overtone units plated with Al, 6 seventh overtone units plated with Al, 6 ninth overtone units plated with Al, and 7 ninth overtone units plated with silver. One unit, a ninth overtone unit base plated only with silver, was shown to have drifted less than nine parts in 10 to the 8th power in 45 days. Other similar units exhibited a similar stability. Drifts registered for most units were a few parts in 10 to the 7th power for the same period. (Author)

Order from GPO $1.25 as
NAS 1.2:Sp 1/5

National Aeronautics and Space Administration, Washington, D. C.
PROCEEDINGS OF FIRST NATIONAL CONFERENCE ON THE PEACEFUL USES OF SPACE, TULSA, OKLAHOMA, MAY 26-27, 1961. [1961] 184p.

DESCRIPTORS: *Aeronautics, Manned, *Space flights, *Satellite vehicles, Nuclear propulsion, Launching, *Space probes, Physiology, *Space navigation, Meteorology, Communication systems, Personnel, Education, Training devices, Conferences

Contents:
NASA space flight programs
Opportunities for industry and education in the space age
Present and future of manned space flight
Science in space
Applying space science to communications, weather and navigation

PB 158 521 $13.50

Office of Scientific Research and Development.
ANTISUBMARINE WARFARE IN WORLD WAR II. by Charles M. Sternhell and Alan M. Thorndike. Rept. on Contract OEMsr-1131. 1946, declassified 15 Dec 59, 195p. Operations Evaluation Group rept. no. 51; AD-221 292.

DESCRIPTORS: *Antisubmarine warfare, *Naval operations, History, Safety, *Attack bombers, *Search radar, *Acoustic torpedoes, Countermeasures, Warfare.

Contents:
History of antisubmarine operations; first period-submerged daylight attacks on Independents, September 1939-June 1940, second period-night surfaced attacks on convoys, July 1940-March 1941, third period-start of wolf packs; end-to-end escort of convoys, April 1941-December 1941, fourth period-heavy sinkings on East Coast of United States, January 1942-September 1942, fifth period-large wolf packs battle North Atlantic Convoys, October 1942-June 1943, sixth period-Aircraft Defeat U-boats' attempted come-back and force adoption of maximum submergence, July 1943-May 1944, seventh period-schnorchel U-boats operate in British home waters, June 1944-end of war, summary of antisubmarine warfare, world war II.
Antisubmarine measures and their effectiveness; safety of independent shipping, convoying and escort of shipping, attacks surface craft, attacks by aircraft, offensive search, employment of search radar in relation to enemy countermeasures, countermeasures to the German Acoustic Torpedo, epilogue, appendix I, glossary, index.

SC-4652(RR) $0.50

Sandia Corp., Albuquerque, N. Mex.
PERFORMANCE OF A HIGH-VELOCITY PROPELLANT GUN FOR CONTROLLED IMPACTS, by R. A. Graham, G. E. Ingram, and W. D. Ingram. Research rept. Nov 61, 7p.

PB 158 445 $6.60

Springfield Armory, Mass.
SUMMARY REPORT ON INVESTIGATIONS OF THE USE OF POWDERED METAL COMPONENTS FOR SMALL ARMS WEAPONS, by J. F. Panda. Rept. on Industrial Preparedness Measure. 15 Mar 61, 66p. Rept. SA-TR19-1213.

DESCRIPTORS: *Small arms, *Small arms ammunition, Production, Materials, *Metal powders, Powders, *Powder metallurgy, Physical properties, Mechanical properties, Tests, Ammunition, Sintering.

This report summarizes results of investigations made to determine the feasibility of using powdered metal fabrication processes in the manufacture of components for small arms weapons. Inconsistent length of service life of components indicated the need of nondestructive testing procedures for quality control of powdered metal parts. (These procedures are being investigated.) Excellent physical properties were obtained with hot-coining techniques. Mechanical properties determined on a test bar heat-treated to Rockwell C36 were: tensile strength, 207,300 p. s. i.; yield strength, 200,000 p. s. i.; elongation in 1 inch, 7.8 per cent; reduction of area, 29.2 per cent; density, 99.5 per cent of maximum. Procedure is given, and results discussed. (Author)

Sanitation and Safety Engineering

TID-13945 $0.75

Atomic Energy Commission. Div of Biology and Medicine, Washington, D. C.
THE EFFECT OF DEPOSITION RATE AND CUMULATIVE SOIL LEVEL ON THE CONCENTRATION OF STRONTIUM-90 IN U. S. MILK AND FOOD SUPPLIES. Oct 61, 54p.

TID-7023 $0.75

Atomic Energy Commission, Washington, D. C.
HIGH EFFICIENCY PARTICULATE AIR FILTER UNITS, by Humphrey Gilbert and James H. Palmer. Aug 61, 33p.

CEX-60.1 $1.75

Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.
EVALUATION OF THE FALLOUT PROTECTION AFFORDED BY BROOKHAVEN NATIONAL LABORATORY MEDICAL RESEARCH CENTER, by H. Borella, Z. Burson and J. Jacovitch. Oct 61, 78p.

NDA-2159-2 $0.75

United Nuclear Corp., White Plains, N. Y.
INVESTIGATION OF GAS-COOLED REACTOR SAFETY PROBLEMS, by L. Goldstein and C. W. Monroe. Technical progress rept. 1 Apr-30 June 61, on Contract AT(30-1)-2303(XVII). July 61, 34p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 158 378 $3.60

Naval [Weapons Plant] Washington, D. C.
IMPROVEMENT OF PRODUCTION METHODS BY THE INSTALLATION OF VIBRATION DAMPENERS TO METAL CUTTING MACHINERY, by L. L. Crosby. Rept. on Industrial Preparedness Study. 30 June 55, 37p. BuOrd Proj. no. 13203.

DESCRIPTORS: *Machine tools, *Cutting tools, Vibration, Damping, *Vibration isolators, Installation, *Naval mobilization, *Industrial production

Many materials can be used in the construction of mounts to dampen or isolate vibration. The two most used are steel coil springs and neoprene synthetic rubber. These are used and tested with the results being outlined throughout this study.

PB 158 897 $3.60

Office of Naval Material, Washington, D. C.
LINE BALANCE TECHNOLOGY. A GRAPHIC METHOD OF INDUSTRY PROGRAMMING. 24 Feb 58, 38p. NAVEXOS P 1851.

DESCRIPTORS: *Industrial production, Programming, Management engineering, *Naval procurement, Procurement, Production.

Line of Balance is a technique for assembling, selecting, interpreting and presenting in graphic form the essential factors involved in a production process from raw materials to completion of the end product, against a background of time. Its basic use is to measure the current relationship of production progress to scheduled performance and to predict the feasibility of accomplishing timely deliveries.
Included in the report are:
Management tracks development programs with applications of line of balance, pub. in The Reserve Weaponeer 15-19, March-May 60
In the making of missiles management uses a tool called line of balance, pub. in Naval Reserve Information Bulletin 12:16-21, 1958.

Engines and Propulsion Systems

UCRL-6570 $1.60

Lawrence Radiation Lab., U. of California, Livermore.
SPACE PROPULSION REQUIREMENTS AND ENGINES, by Robert H. Fox. Rept. on Contract W-7405-eng-48. July 61, 15p.

AD-263 233 $0.75

Rock Island Arsenal Lab., Ill.
EVALUATION OF FLEXIBLE INSULATION FOR SOLID PROPELLANT ROCKET MOTOR GASES, by Donald H. Sale. 2 Aug 61, 36p. 5 refs. Rept. no. 61-2915.

DESCRIPTORS: Propellants, *Rocket motors, *Rocket cases, *Thermal insulation, *Insulating materials, Tests, Oxygen, Acetylenes, Chemical torches

A low gas velocity oxyacetylene torch test evaluation of candidate insulation materials for solid propellant rocket motor cases is described. Results are presented for insulations based on thirteen polymer vulcanizates. The effects of various fillers and several curing systems on the insulation index of vulcanizates are furnished. The time in seconds for the temperature on the back side of the specimen to rise to 200°C is the prime basis of evaluation. The polymers which showed the best insulating ability were vinylidene fluoride/hexafluoropropylene and polychloroprene. These gum polymers, and butadiene/styrene when compounded with fillers, produced vulcanizates with high insulation indices. Phenolic resins improved the insulating ability of vinylidene fluoride/hexafluoropropylene but interfered with the curing mechanism. (Author)

AD-258 798 $2.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
EXPERIMENTAL PERFORMANCE OF A PULSED GAS ENTRY COAXIAL PLASMA ACCELERATOR, by P. Gloersen, B. Gorowitz, and W. Palm. Rept. on Plasma Characteristics, Contract [AF] 04(647)269. Apr 61, 25p. 3 refs. Technical Information Series R61SD042.

DESCRIPTORS: *Plasma physics, *Accelerators, Thrust, Specific impulse, Rocket propulsion, Coaxial cables, *Plasma jets, Spaceships, *Ion rockets.

The performance of a pulsed gas entry coaxial type plasma accelerator has been evaluated by several experimental techniques. With 4500 joules stored in the capacitor bank, the performance of the accelerator is as follows: Calorimeter measurements indicate that at least 25% of the energy originally stored in the capacitor appears as unidirectional kinetic energy in the plasma exhaust (1125 joules). The impulse delivered to the ballistic pendulum under these conditions was 3950 dyne-seconds. The time-of-flight measurements indicate an average specific impulse of 6000 seconds, in agreement with the specific impulse deduced from the impulse and kinetic energy measurements. Rotating mirror camera records show that initial portions of the plasma emanate at a specific impulse as high as 25,000 seconds, and that subsequent portions emanate at a specific impulse of 6000 seconds. (Author)

Transport, Traction and Hoist Facilities

PB 159 084 $2.60

Charleston Naval Shipyard, S. C.
INFORMAL AND LETTER REPORTS ON VIBRATION PROBLEMS FOR 1959, by D. M. Williamson, E. H. Robertson, and H. H. Nathan. [1959] 30p. 1 ref. AD-232 310.

Portions of this report will not reproduce well.

DESCRIPTORS: *Vibration, *Marine engines, Maintenance, Gears, Couplings, Tests, Ship hulls, Shafts, Bearings.

PB 159 085 $6.60

Long Beach Naval Shipyard, Calif.
COLLECTION OF REPORTS OF VIBRATION SURVEYS CONDUCTED BY LONG BEACH NAVAL SHIPYARD 1959. [1959] 68p. 37 refs. AD-234 695.

Portions of this report will not reproduce well.

DESCRIPTORS: *Vibration, Statistical analysis, Ship hulls, Sonar equipment, Propulsion, Refrigerant compressors, Gun directors, *Naval vessels, Generators, Shipborne, Picket ships, Destroyers, Minesweepers, Cruisers, Tankers, Landing craft, Destroyer tenders.

PB 158 469 $2.60

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
CALIBRATION OF THE MODEL RM-C TRI-AXIS IMPACT RECORDERS, by Anderson Miller. Interim rept. on Container Development. Feb 61, 29p. 2 refs. QMFCIAF rept. no. 1-61; Technical rept. no. 221; AD-250 547.

DESCRIPTORS: *Recording devices, Calibration, Shock, Measurement, Test equipment, Tests, *Test sets, *Military equipment, Transportation, Military transportation, *Supplies, *Containers, Vibration.

The Model RM-C Impact Recorders were calibrated for the purpose of measuring shock which occurs in transportation of supplies along military supply lines. Test equipment consisted of the incline impact testers and vertical drop testers. Instrumentation used to calibrate the recorders consisted of a strain-gage-bridge-type accelerometer feeding the impulse into a high-gam oscilloscope. (Author)

MATERIALS

PB 157 744 $8.10

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
SOFT MAGNETIC MATERIALS, by G. P. Seitanakis. Final rept. 1 Mar 55-31 May 57, on Contract DA 36-039-sc-64542. 1 Aug 57, 86p. AD-161 765.

DESCRIPTORS: *Magnetic cores, *Magnetic materials, Silicon, Iron, Alloys, Magnetic properties, Laminates, Filament-wound construction.

The work done during the contractual period was on thin gage 3.25% silicon iron strip for experimentally processed and commercially available material. Data have been reported which indicate that the commercial thin gage strip is magnetically superior to the experimentally processed material. The effects of insulating coatings, annealing atmospheres, and stress relief annealing temperatures on the magnetic properties of the commercial silicon iron strip were also investigated and are reported. (Author)

AD-264 903 $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
REVISION OF FEDERAL SPECIFICATION P-C-436a, by A. Mankowich. 22 June 61, 23p. 2 refs. CCL # 108

DESCRIPTORS: *Cleaning fluids, *Specifications, Steam cleaning, Alkali metal compounds, Corrosion, Electrolysis, Aluminum, Magnesium, Tests.

Federal Specification P-C-436a, "Cleaning Compound, Alkali Type", was revised to include the latest improvements in technology and its application was extended for use as a hydrosteam cleaning compound. The principal changes were in the following areas: (1) inclusion of composition requirements. (2) The use of anhydrous Na_3PO_4, Na_2SiO_3 and NaH_2PO_4 instead of the hydrated forms of these salts. (3) Inclusion of a galvanic corrosion test requirement, using an aluminum-magnesium couple. The anhydrous composition exhibited less caking tendencies and gave a weight saving of 35 percent. (Author)

SRO-47 $2.25

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
DETERMINATION OF THE UNIFORMITY OF MIXING OF PORTLAND CEMENT AND BITUMINOUS CONCRETE FOR VARIOUS MIXING TIMES BY THE USE OF RADIOISOTOPES, by Clyde Poovey and Donald O. Covault. Annual rept. no. 1, 1 Dec 60-31 Mar 61, on Contract AT(38-1)-202. Apr 61, 108p.

PB 158 928 $6.60

Goodrich, B. F., Co., Brecksville, Ohio.
POLYURETHANE JACKETED WD-1 ( )/TT FIELD TELEPHONE WIRE, by C. S. Schollenberger, K. Dinbergs and others. Final rept. for 1 Dec 58-15 July 59 on Contract DA 36-039-sc-74972. 16 July 59, 66p. 2 refs. AD-229 948.

DESCRIPTORS: *Field wire, *Plastics, Insulating materials, Electric insulation, Design, Urethanes, Polymers, Hydrazones, Aldehydes, Climatic factors, *Telephone cables, *Plastic insulators, Wire.

Attempts to jacket WD-1 wire core with a hard, tough carbon black-loaded poly-(ester-urethane) prepared from m-phenylene diisocyanate, hydroxyl poly (tetramethylene adipate), and cyclohexanediol-1, 4 [Estane Armor (5/1/4)], resulted in a poorly centered wire which failed the -40°C mandrel wrap test in contrast to the earlier behavior of 25 mil diameter monofilaments of the same stock. 50 parts of Estane VC (black) added to this compound, apparently provide the low temperature flexibility, weather- and abrasion-resistance, etc. required in WD-1 wire jacket. Repeated attempts to obtain a satisfactory jacket of this blend on WD-1 wire core were also unsuccessful. A poly(ester-urethane) composition based on 2, 2-bis (4-β-hydroxy-ethoxyphenyl) propane is described, as well as aromatic urethane terpolymers based on cyclohexanediol-1, 4-bis(2-hydroxyethoxy) benzene. The effectiveness of the 2, 4-dinitrophenyl-hydrazones of 2-octanone and isopentaldehyde as weather resisters in Estane VC is described. The weather resistance of Estane VC containing Polyurethane Hardener resin and carbon black is reported. Further comparison of the Weatherometer and outdoor aging of the Estane VC type, and Zytels 3606 and 37X as monofilaments and microdumbbells is made. Monofilament and LS abraders are described. (Author)

PB 159 068 $10.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON ELASTOMERIC AND PLASTIC MATERIALS (SECOND ADDENDUM), by N. J. Broadway, R. Mayer and others. Rept. on Contract AF 33(616)6564, continuation of Contract AF 33(616)5171. 30 Apr 60, 136p. 69 refs. REIC rept. no. 3 (Second addendum); AD-239 264.

DESCRIPTORS: *Elastomers, *Plastics, *Radiation effects, Neutron bombardment, Gamma rays, Vulcanization, Polymerization, Dosage, Radiation damage, Bibliography.

The report summarizes the radiation-effects information on the various elastomers and plastics for which data have been published during 1959. Radiation polymerization and radiation vulcanization are included in this report only if the data have bearing on radiation effects on polymers. This second addendum report is intended to be sufficiently inclusive to make it valuable as a reference guide on the effects which can be anticipated from nuclear radiation on elastomers and plastics. (Author)

PB 155 487 $1.10

Rock Island Arsenal Lab., Ill.
HEAT STABILITY OF ARYLENE MODIFIED SILOXANES AT TEMPERATURES OF 700°, 800° and 900°F, by E. W. Bergstrom and A. C. Hanson. 17 Feb 61, 6p. 1 ref. Rept. no. 61-645; AD-252 611.

DESCRIPTORS: *Silicones, Polycyclic compounds, Benzenes, Fluorides, Vinyl radicals, Tests, Methyl radicals, Phenyl radicals, Propenes, *Elastomers, *Synthetic rubber, Deterioration, Heat resistant polymers, Ethers, Temperature, Mechanical properties.

Arylene modified siloxanes are much more heat stable at 700, 800 and 900 F than conventional silicone elastomers. The heat stability of the arylene modified siloxanes varies according to the degree of aromaticity (siloxane with greatest degree of aromaticity has best heat resistance). The heat stability of the siloxane having the greatest degree of aromaticity is superior to that of a vinylidene fluoride/hexafluoropropylene vulcanizate at 800 and 900 F. (Author)

Ceramics and Refractories

ANL-6426 $1.00

Argonne National Lab., Ill.
ELECTRICAL PROPERTIES OF GLASS, by Robert Kepple. A bibliography. Rept. on Contract W-31-109-eng-38. July 61, 37p.

GEMP-5A $1.25

General Electric Co., Cincinnati, Ohio.
HIGH TEMPERATURE MATERIALS PROGRAM. Progress rept. no. 5, part A, on Contract AT(40-1)-2847. Nov 61, 55p.

PB 159 072 $1.60

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
REPORT ON THE THERMAL CONDUCTIVITY OF SOME REFRACTORY MATERIALS AT ELEVATED TEMPERATURES, by M. A. Schwartz. Apr 49, 18p. 29 refs. NEPA 1015 EMR 57.

DESCRIPTORS: *Refractory materials, Graphite, Carbon, Beryllium, Beryllium compounds, Silicon, Silicon compounds, Uranium, Uranium compounds, Oxides, Dioxides, Carbides, Titanium, Tantalum, Tungsten, Molybdenum, Thorium compounds, Zirconium compounds, Stainless steel, Steel, Thermal conductivity, *High temperature research.

The materials considered in this report are: graphite, carbon, beryllium, beryllium oxide, beryllium carbide silicon, silicon dioxide, silicon carbide, uranium, uranium oxides, uranium carbides, titanium, tantalum, tungsten, molybdenum, thoria, zirconia, 18-8 stainless steel.

PB 159 007 $7.60

New York State U. Coll. of Ceramics, Alfred U.
GRAIN SIZE EFFECTS ON THE THERMAL CONDUCTIVITY OF CERAMIC OXIDES, by R. S. Truesdale, J. J. Swica, and J. R. Tinklepaugh. Progress rept. no. 11, 1 Nov 59-30 Apr 60, on Contract AF 33(616)3798. 75p. 58 refs. AD-240 278.

DESCRIPTORS: Magnesium compounds, Aluminum compounds, Oxides, Heat transfer, *Crystals, Crystal structure, Sintering, Chemical impurities, *Ceramic materials, Density, Heat treatment, Microstructure, Thermal conductivity, Conductivity.

Sintering studies were conducted on several grades of magnesia employing hot pressing techniques. The raw materials used had less than one-half percent impurity. In several cases one-half percent lithium fluoride was added as a sintering agent. The results of this study are discussed in terms of grain growth as a function of temperature and time of sintering. Density variations are also shown to indicate the degree of sintering. High purity, dense, fine grained alumina specimens were used to study the effect of grain size on thermal conductivity. The thermal conductivity from 100° to 1000° C decreased in specimens below ten microns average grain size with a maximum decrease in conductivity of eight percent at two microns. The decrease in thermal conductivity with decreasing grain size was found to follow closely an additive reciprocal volume relationship, which has been discussed by several investigators. The role of impurities in masking this effect in dense alumina samples greater than 99% pure was shown by measuring the thermal conductivity of specimens with small variations in impurity content. (Author)

Fuels, Lubricants, and Hydraulic Fluids

PB 159 011 $11.00

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
FLUID OSCILLATIONS IN A CIRCULAR CYLINDRICAL TANK, by Helmut F. Bauer. 18 Apr 58, 143p. 6 refs. Rept. no. DA-TR-1-58.

DESCRIPTORS: *Fuel tanks, Cylindrical bodies, Aerodynamics, *Fuels, Motion, Oscillation, Fluid flow, *Fluid, Mechanics

The linearized fluid dynamics equations for a liquid with free fluid surface in a circular cylindrical tank, performing harmonic translation and rotation around the center of gravity of the undisturbed fluid were solved for ideal fluid (incompressible and non-viscous). The general solutions of the velocity potential are derived for the free oscillation and the two forced oscillations (translation and rotation). The wave form of the free fluid surface, the pressure distribution, the fluid force on the tank wall, the moment of the fluid around the center of gravity of the undisturbed fluid, the velocity distribution and the center of force are given. The effect of the fluid for different frequencies and fluid height ratios $\frac{h}{a}$ is shown in various curves. (Author)

PB 159 012 $3.60

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
FLUID OSCILLATION IN A CYLINDRICAL TANK WITH DAMPING, by Helmut F. Bauer. 23 Apr 58, 39p. 1 ref. Rept. no. DA-TR-4-58; AD-160 275.

DESCRIPTORS: *Fuel tanks, Cylindrical bodies, Aerodynamics, Load distribution, *Fuels, Motion, Oscillation, Fluid flow, *Fluid mechanics, Damping

The exact solution for fluid oscillations in a circular cylindrical tank are applied to the case of damped fluid oscillations by introducing imaginary terms in the resonance terms. Measurements were performed with different damping devices, and approximate damping factors were determined from measurements such as the free fluid surface, the fluid force, the pressure difference, and their phases. Experimental values were used in theoretical curve sets with different damping factors and the approximate damping factor was determined at resonance. An iteration method also gave the approximate damping factor directly from experimental results. The best damping is obtained by perforated long single ring baffles.

PB 158 908 $2.60

Southwest Research Inst., San Antonio, Tex.
SLOSHING OF LIQUIDS IN CYLINDRICAL TANKS OF ELLIPTIC CROSS-SECTION, by Wen-Hwa Chu. Technical rept. no. 2 on Contract DA 23-072-ORD-1251. 26 Sep 58, 27p. 12 refs.

DESCRIPTORS: *Fuel tanks, *Fuels, Motion, Oscillation, Potential theory, Pressure, Moments, Determination, Differential equations, Cylindrical bodies, *Fluid mechanics

An analysis is made of the sloshing of liquids in partially-filled rigid cylindrical tanks of elliptic cross-section. By application of potential theory, the forces and moments acting on the tank are determined for the case of translational and rotational excitation along or about the major and minor axes of the cross-section, and expressions for the resonant frequencies are found in terms of the roots of the derivatives of modified Mathieu functions. The lowest few resonant frequency parameters, as computed from those expressions, are compared with those of a circular cylinder having the same cross-sectional area. (Author)

MATHEMATICS

PB 159 071 $4.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TABLES OF EVEN AND EVEN MODIFIED MATHIEU FUNCTIONS OF ORDER ONE OF THE FIRST KIND AND THEIR DERIVATIVES, by G. R. Valenzuela and C. V. Bitterli. Rept. on Contract NOrd-7386. Nov 59, 41p. 7 refs. CM-966; AD-232 227.

DESCRIPTORS: Series, Differential equations, *Functions, Tables, Digital computers, Operation, Equations

The tables include the values of the even Mathieu functions of order one, the values of the even modified Mathieu functions (radial Mathieu functions) of order one, and the values of their derivatives. The values are tabulated for values of the parameter s ranging from 0 to 10 in steps of 0.5. The even Mathieu functions of order one and their derivatives are tabulated for values of the argument from 0^{o} to 90^{o} in steps of 5^{o} for each s. The even modified Mathieu functions of order one and their derivatives are tabulated for values of the argument from 0 to 3.0 in steps of 0.1 for each s. The even Mathieu functions of order one were normalized so that their value at the origin is unity. The values for these tables were obtained by using a UNIVAC 1103-A computer. (Author)

PB 158 558 $2.60

California U., Berkeley.
THE DIFFERENTIABILITY OF SOLUTIONS OF CERTAIN VARIATIONAL PROBLEMS FOR MULTIPLE INTEGRALS, by E. R. Buley. Technical rept. no. 16 on Contract Nonr-222(62). Dec 60, 25p. 11 refs. AD-252 642.

DESCRIPTORS: *Integrals, Inequalities, Partial differential equations, Equations.

PB 158 556 $3.60

California U., Berkeley.
THE DIMENSION OF THE SQUARE OF A SPACE, II, by I. Fáry. Technical rept. no. 14 on Contract Nonr-222(62). Dec 60, 33p. 15 refs. AD-252 641.

DESCRIPTORS: *Algebraic topology, Topology.

Contents:
Some properties of the tensor product
Some properties of the torsion product
Cohomology in compact and locally compact spaces
Cohomology and dimension
Dimension of the square of a space

PB 158 557 $2.60

California U., Berkeley.
TRANSLATION INVARIANT, ADDITIVE FUNCTIONALS RELATED TO MIXED VOLUMES, by I. Fáry. Technical rept. no. 15 on Contract Nonr-222(62). Dec 60, 30p. 9 refs. AD-252 640.

DESCRIPTORS: *Geometry, Integrals, Functions.

Contents:
Definition, and some basic properties of mixed volumes
Mixed volumes of an arbitrary body with a box
Translation invariant, additive functionals, which can be expressed as linear combinations of mixed volumes

PB 158 570 $1.60

Columbia U., New York.
DECOMPOSITION THEOREMS FOR S(n)-COMPLEXES, by Albrecht Dold. Rept. on Contract Nonr-266(57). [1960] 14p. 6 refs. CU-6-ONR-266(57)-M; AD-249 208.

DESCRIPTORS: *Algebraic topology, *Groups (Mathematics), Combinatorial analysis, Theory, Topology.

Unified proofs are given for several known (or partially known) decomposition theorems for chain-complexes on which the symmetric group S(n) operates. The method is elementary (although abelian categories occur), with transfer homomorphism playing an essential role. (Author)

PB 158 668 $1.10

Columbia, U., New York.
GENERALIZATIONS OF THE BALLOT PROBLEM, by Lajos Takacs. Rept. on Contract Nonr-266(59). 13 Dec 60, 9p. 5 refs. CU-23-61-Nonr-266(59)MS; AD-249 547.

DESCRIPTORS: *Probability, Statistical data, Mathematical prediction, Arithmetic

PB 158 578 $1.10

Columbia U., New York.
ON SPHERE BUNDLES WITH VANISHING EULER CLASS, by Franklin P. Peterson (Massachusetts Inst. of Tech.) and Norman Stein. Rept. on Contracts Nonr-266(57) and DA 19-020-ORD-4851. [1960] 8p. 6 refs. CU-4-ONR-266(57)-M; AD-249 209.

DESCRIPTORS: *Algebraic topology, Groups (Mathematics), Theory, Sequences, Topology.

PB 158 941 $3.60

Rutgers State U. [New Brunswick, N. J.]
ANALYSIS OF MEANS, by Ellis R. Ott. Technical rept. no. 1 on Contract Nonr-404(11). 10 Aug 58, 35p. 25 refs. AD-226 785.

DESCRIPTORS: *Statistical analysis, Theory, Statistical data

The methods of analysis described are an extension of Shewhart control chart techniques, and encourage experimentation. The method compares, directly, differences between means instead of variance ratios. The underlying concepts of the 2 procedures are the same; the conclusions are usually the same, but the nature of some exceptions are indicated. One method of studying a scientific process is to hold constant all variables which are suspected of contributing to the variability of the process, and then decide whether the resulting pattern of observations represents a well-behaved source, or whether there is evidence of non-randomness. A second method of experimentation is to vary, in a predetermined experimental design, different factors suspected of contributing to the variation of the process, and then compare effects by an analysis of variance.

Computing Devices

PB 171 265 $10.00

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A THIRD SURVEY OF DOMESTIC ELECTRONIC DIGITAL COMPUTING SYSTEMS, by Martin H. Weik. Mar 61, 1128p. 44 refs. BRL rept. no. 1115, supersedes BRL rept. 1010, June 57; AD-253 212.

DESCRIPTORS: *Digital computers, *Programming, Bibliography, *Computers, Data processing systems, Data storage systems.

Based on the results of a third survey, the engineering and programming characteristics of two hundred twenty-two different electronic digital computing systems are given. The data are presented from the point of view of application, numerical and arithmetic characteristics, input, output and storage systems, construction and checking features, power, space, weight, and site preparation and personnel requirements, production records, cost and rental rates, sale and lease policy, reliability, operating experience, and time availability, engineering modifications and improvements and other related topics. An analysis of the survey data, fifteen comparative tables, a discussion of trends, a revised bibliography, and a complete glossary of computer engineering and programming terminology are included. (Author)

PB 156 631 $1.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY ON APPLICATION OF CODING THEORY, by A. E. Laemmel. Semiannual rept. no. 1, 1 June-30 Sep 60, on Contract DA 36-039-sc-78972. 14 Feb 61, 19p. 5 refs. Rept. no. PIBMRI-895.1-61; AD-254 364.

DESCRIPTORS: *Algebras, *Coding, Errors, Computers, Combinatorial analysis.

An algebra is described which is particularly suited to studying the combinatorial properties of strings of symbols or code words. The codes which might be analyzed include signal compressing codes, error correcting codes, computer codes, natural languages etc. Such properties as unique decomposability, ergodicity,

synchronization etc., can be studied. The algebra can be extended to cover the case of compound codes, i.e., codes which cannot be described by a single finite code table. (Author)

PB 157 290 $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
CONSTRUCTION OF CONVOLUTION CODES BY SUBOPTIMIZATION, by Marvin A. Epstein, Doctoral thesis. Rept. on Contract DA 36-039-sc-78108. 18 Nov 59, 23p. 15 refs. Technical rept. 341; AD-235 159.

DESCRIPTORS: *Coding, Digital computers, Theory.

A procedure for suboptimizing the choice of convolution codes is described. It is known that random convolution codes that have been passed through a binary symmetric channel, or a binary erasure channel, have a low probability of error and are easily decoded, but no practical procedure for finding the optimum convolution code for long code lengths is known. A convolution code is defined by its generator. It is proved that by sequentially choosing the generator digits, one can obtain a code whose probability of error decreases as fast as, or faster than, the usual upper bound for a random code. Little effort is required for suboptimizing the choice of the first few generator digits. This effort increases exponentially with the choice of successive generator digits. For a rate of transmission equal to 1/2, and the given procedure, a code of length 50 is the approximate limit, with the use of the digital computers that are available at present. (Author)

PB 158 037 $6.60

Stanford Electronics Labs., Stanford U., Calif.
DESIGN AND APPLICATION OF A DIGITAL CONTROLLER USING MAGNETIC DRUM STORAGE, by J. Knudson. Rept. on Contract Nonr-225(24). 28 Nov 60, 62p. 6 refs. Technical rept. no. 2100-2; AD-248 097.

DESCRIPTORS: *Magnetic recording systems, *Data storage systems, *Analog computers, *Digital computers, Design, Circuits, Simulation, Operation, Sampling, Computers.

The design and test of a hybrid, analog-digital, computer which is capable of simulating the operation of a digital computer in the analog simulation of dynamical systems is described. The analog of discrete numbers is a dc voltage which bears a one-to-one relationship to pulse trains of variable pulse rate which are stored on the surface of a magnetic drum. Tests include: (1) the stabilization of systems containing two and three integrations; (2) the generation of a series of numbers by numerical inversion of a z transform; and (3) the simulation of two numerical integration rules. (Author)

PB 158 934 $10.10

Columbia U., New York.
MECHANICS OF GRANULAR MATTER, by H. Deresiewicz. Technical rept. no. 25 on Contract Nonr-266(09). Feb 57, 122p. 83 refs. CU-29-57-ONR-266(09)-CE; AD-129 626.

DESCRIPTORS: *Spheres, *Crystals, *Soils, Mechanical properties, *Mechanics, Stresses, Mathematical analysis.

A discussion is presented of the recent progress in the investigation of the static and dynamic response of granular media to external forces. A summary of the geometry of packing is given. The theory of contact of elastic bodies is invoked to describe some of the phenomena, and it is extended to account for contact from oblique forces and from twisting couples. The various investigations of the static and dynamic behavior of granular media are grouped by the types of models used in approaching the subject matter. Unsolved problems in the fields of study are briefly outlined.

PB 158 790 $9.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
RESEARCH AND DEVELOPMENT ON INDUCTION HEATING METHODS OF SIMULATING AERODYNAMIC HEATING, by B. E. Mathews. Final rept. Phase 1, on Contract AF 33(616)5703, continuation of Contracts AF 33(038)9988, AF 33(600)682, and AF 33(616)3293. Mar 61, 116p. WADC Technical rept. 59-523, Part I; AD-254 697.

DESCRIPTORS: *Aerodynamic heating, Capacitors, *Induction heating, Simulation, Cooling, *Radio-frequency coils, Dielectrics, Coils, Electric insulation, Insulating materials, Voltage, High temperature research, Circuits, *Transmission lines, Thermal insulation, Water coolers, Heat transfer, Aluminum, Thermodynamics, Stainless steel, Test methods, Electric currents.
The results of a series of tests on high temperature insulation for use between the work-coil and work are discussed. Also included is a discussion of the work-coil current requirements based on a power block of 250 kw, the range of work-coil impedances, and the voltage limitations of the insulation. The results of studies directed toward the design of a short flexible transmission line suitable for carrying the full work-coil current are outlined. The use of a resonating capacitor at the work-coil terminals to reduce the required transmission line current is analyzed. The circuitry and considerations involved in linking the terminating network with the work-coil are studied with emphasis on maximum voltages, capacitive ground currents, and alignment problems. Research performed in developing a flexible water-cooled work-coil and methods of attaching the work-coils to the structure are described. (Author)

PB 157 407 $5.60

Harvard U., Div. of Engineering and Applied Physics, Cambridge, Mass.
THE ELASTIC MODULI OF HETEROGENEOUS MATERIALS, by Zvi Hashin. Technical rept. no. 9 on Contract Nonr-1866(02). Sep 60, 60p. 23 refs. AD-245 469.

DESCRIPTORS: *Elasticity, Theory, *Mechanics, Stresses, Particles.

An effort is made to construct the approximate upper and lower bounds for the elastic moduli of a heterogeneous body. A simple expression is derived which is always smaller than the upper bound and larger than the lower one and can be used as a good approximation to the shear modulus whenever the bounds are close. General expressions for the elastic moduli of a quasi-homogeneous heterogeneous material are developed which involve only the stresses or strains inside the particles. This is done by considering the change in strain energy in a loaded homogeneous body owing to the insertion of nonhomogeneities. It is shown that bounds for the moduli can be obtained by suitable choice of admissible stress and displacement fields. The assumption is made that the particles are spherical and that the action of the whole heterogeneous material on any one particle is transmitted through a spherical shell which lies wholly in the matrix.

KAPL-M-EC-10 $5.60

Knolls Atomic Power Lab., Schenectady, N. Y.
BMS STRESS ANALYSIS OF CYLINDRICAL SHELLS, by D. G. Dight and R. F. Wojcieszak. Rept. on Contract W-31-109-eng-52. Aug 61, 56p.

PB 158 907 $7.60

Polytechnic Inst. of Brooklyn, N. Y.
ON THE INVESTIGATION OF THE GENERAL INSTABILITY OF REINFORCED CYLINDRICAL SHELLS BY ENERGY METHODS, by Sol R. Bodner and F. S. Shaw. Rept. on Contract N6onr-26303. Jan 54, 71p. 14 refs. PIBAL rept. no. 238; AD-27 976

DESCRIPTORS: *Cylindrical bodies, Deformation, Plasticity, Theory, Energy, Hydrostatic pressure, Stresses.

A review is presented which covers criticisms and extensions together with comments on investigations presented in Pibal Reports, numbers 167, 169, 177, 182, 189, and 202. Expressions are derived for the change in the total energy of a reinforced shell as it passes from an initial stressed state to an adjacent buckled state; these are believed to be good approximations to the complete energy expressions for all cases of practical interest. The simplifying assumptions made by various investigators on the prebuckling stress state of a reinforced shell are not considered to be sufficiently general for use in a general instability analysis. A stress analysis is presented which is believed to be in better agreement with the results of the more exact stress analyses. The use of simple sine waves to represent the buckled shape of the shell between the end bulkheads is not believed to be the best possible shape to use for a reinforced shell because it does not consider the resistance to the deformation of the intermediate ring stiffeners. A more realistic buckled configuration based on an analysis of the shell and ring stiffeners is recommended in carrying out the Rayleigh-Ritz method.

Hydrodynamics, Hydraulics, and Hydrostatics

Order from GPO $0.70 as C 37.23:3

Bureau of Public Roads, Dept. of Commerce, Washington, D. C.
DESIGN CHARTS FOR OPEN-CHANNEL FLOW. 1961, 105p. Hydraulic Design Series no. 3.

DESCRIPTORS: *Roads, Drainage, *Hydraulic systems, Design

This publication makes generally available a group of hydraulic charts which facilitate the computation of uniform flow in open channels. Some of the charts are also useful in the design of storm drains. The publication is intended as a working tool that should be of considerable service to the designer already familiar with the subject.

PB 157 523 $7.60

[Davidson Lab.] Stevens Inst. of Tech., Hoboken, N. J.
MOTION, BENDING MOMENT AND SHEAR MEASUREMENTS ON A DESTROYER MODEL IN WAVES, by Edward V. Lewis and John F. Dalzell. Rept. on Contracts N6onr-247(05) and Nonr-263(09). Apr 58, 72p. 15 refs. Rept. no. 656; AD-161 145.

DESCRIPTORS: *Destroyers, Motion, Model tests, *Ship hulls, Stresses, *Water waves, *Hydrodynamics, Shear stresses.

The report presents the results of a series of tests on a model of a DD-692 destroyer (long-hull) in regular and irregular head and following seas. Measurements were made of pitching and heaving motions and of the external load in terms of bending moments and shear at the midship section. Confirmation was obtained of the importance of investigating conditions in which synchronism occurs between the natural pitching (and/or heaving period) and the period of encounter with regular waves. A gradual upward trend of the range of bending moments at the midship section was observed in all regular wave lengths as the speed was increased. Wave patterns used for irregular wave tests corresponded closely to those expected at sea in a typical 30 to 32 knot wind. Tests over a range of ship speeds showed a rapid increase in deck wetness and slamming with increasing speed, but no appreciable change in average and extreme values of bending moments except for a gradual increase in sagging moments at speeds above 15 knots. The frequency of bottom impact and shipping of water at these speeds indicated that speeds much above 15 knots may be unrealistically high for this particular sea condition. (Author)

HW-65722 $3.60

Hanford Atomic Products Operation, Richland, Wash.
DESCRIPTION OF THE THERMAL HYDRAULICS LABORATORY AT HANFORD, by J. M. Batch and K. G. Toyoda. June 60, 40p.

TID-14148 $4.60

Hanford Atomic Products Operation, Richland, Wash.
HYDRAULIC STUDY OF A WATER WALL FOR AN ATOMIC REACTOR, by C. Lomax. Sep 57, 43p.

TID-14160 $4.60

Hanford Atomic Products Operation, Richland, Wash.
HYDRAULIC STUDY OF A WATER WALL FOR AN ATOMIC REACTOR, by E. Roy Tinney. Rept. on Contract DDR-26. June 58, 48p.

Order from GPO $1.25 as C 13.10:238

National Bureau of Standards, Washington, D. C.
HYDRAULIC RESEARCH IN THE UNITED STATES, 1961, ed. by Helen K. Middleton. 15 Aug 61, 220p. Miscellaneous Publication 238.

DESCRIPTORS: Hydraulic systems, Hydraulic reservoirs, *Hydrology, *Hydraulic research, Bibliography

The information contained in this publication was compiled from reports by the various hydraulic and hydrologic laboratories in the United States and Canada. Projects are numbered chronologically, and the number once assigned is repeated for identification purposes until a project is completed. All projects are in active state unless otherwise noted.

PB 158 942 $4.60

Reed Research, Inc., Washington, D. C.
THE CONSTRUCTION OF THE TOTAL HARMONIC VELOCITY FIELD AROUND A GENERAL ELLIPSOIDAL SUBMARINE WITH ONE PROPELLER, by Johann Martinek, Henry de Beaumont, and Gordon C. K. Yeh. Final rept. 1 on Contract Nonr-1445(00). 31 Dec 57, 47p. 15 refs. AD-200 699.

DESCRIPTORS: *Ellipsoids, *Submarines, *Marine propellers, *Hydrodynamics, *Fluid flow, Mathematical analysis, Green's function, Partial differential equations, Potential theory, Velocity

The construction of Green's function for the Dirichlet problem related to ellipsoids was completed. The solutions for self-propelled bodies of general shape in a real infinite fluid domain are not available, and the ultimate solution of the total harmonic velocity field around a general ellipsoidal submarine with 1 propeller is still very remote. Simple shaped bodies with simple propellers have been solved in an ideal infinite fluid field obeying the Laplace equation, but all the self-propelled bodies treated to date were essentially confined to shapes of point or axial symmetry (spheres, spheroids). Solutions are nonexistent for the more general problem of self-propelled bodies with plane symmetry (ellipsoids), in ideal fluid fields. The ellipsoid was studied from a general point of view with several objectives in mind. A summary of known classical results is given and clarified, then a new method pertaining to homothetic ellipsoids is developed, and some of the classical results rederived in search of a formulation adaptable to the construction of theorems. A discussion following the homothetic ellipsoid study is presented to elucidate clearly on the difference between the Dirichlet and the Neumann problem.

METALLURGY

USBM-U-863 $0.50

Albany Metallurgy Research Center, Ore.
METALLURGICAL PROGRESS REPORT NO. 12, 1 July-30 Sep 61, on Contract AT(11-1-599. 13p.

IS-374 $0.50

Ames Lab., Iowa State U. of Science and Tech.
A STUDY OF SEVERAL METALS AS REDUCTANTS FOR YTTRIUM FLUORIDE, by J. A. Haefling, F. A. Schmidt, and O. N. Carlson. Rept. on Contract W-7405-eng-82. Sep 61, 19p.

ANL-6393 $0.50

Argonne National Lab., Ill.
THE EFFECT OF MANGANESE AND SILICON CONTENT ON THE HOT WORKABILITY OF TYPE 304 STAINLESS STEEL CONTAINING 2 w/o BORON, by L. C. Hymes and N. Balai. Rept. on Contract W-31-109-eng-38. Oct 61, 12p.

ANL-6434 $0.75

Argonne National Lab., Ill.
ELECTRICAL MEASUREMENTS ON THE GROWING SCALE ON ZIRCONIUM-TITANIUM ALLOYS, by R. D. Misch and G. W. Iseler. Rept. on Contract W-31-109-eng-38. Oct 61, 27p.

NAA-SR-6227 $0.75

Atomics International, Canoga Park, Calif.
CASTING OF LONG AND THIN PLATES OF URANIUM-MOLYBDENUM ALLOYS, by N. H. Katz and M. H. Binstock. Rept. on Contract AT(11-1)-GEN-8. Nov 61, 32p.

PB 159 004 $4.60

Brown U. Div. of Engineering, Providence, R. I.
THE INFLUENCE OF BASIC DESIGN AND PROCESSING VARIABLES ON THE PROPERTIES OF SINTERED WC-Co ALLOYS, by J. Gurland. Rept. on Contract DA 19-020-ORD-4888. Apr 60, 43p. 12 refs. DA-4888/3; OOR rept. 2060:3.

DESCRIPTORS: *Tungsten compounds, *Carbides, *Cobalt, *Alloys; Sintering, Design, Mechanical properties, Density, Loading, Grains (Metallurgy), Temperature, *Brittle materials, Materials.

The characteristic properties of sintered carbides are accounted for by the nature of brittle fracture and the specific influences of volume, surface finish, loading rate and grain size upon fracture strength are demonstrated by experimental results. The effects of mixing procedures and sintering conditions upon density, composition and structure are evaluated on the basis of the liquid phase sintering mechanism. Also considered are compacting pressure, pressureless consolidation, infiltration, and paraffin addition as factors which influence the properties. (Author)

61GL192 $2.60

General Engineering Lab., Schenectady, N. Y.
INVESTIGATION OF THE WEAR PROPERTIES OF GREEK ASCOLOY (AMS 5616) FOR THE NPR DIVERSION VALVE, by R. E. Lee, Jr. Sep 61, 25p.

NYO-9640 $19.75

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
THE COMPRESSIBILITY AND INTERNAL FRICTION OF CERTAIN BINARY LIQUID ALLOYS, by Gerald Abowitz and Robert B. Gordon. Rept. on Contract AT(30-1)-2029. Aug 61, 307p.

HW-64452 $1.50

Hanford Atomic Products Operation, Richland, Wash.
QUALITY EVALUATION OF ZIRCALOY-2 SHEATH TUBING, by P. L. Farnsworth, H. P. Oakes, and R. B. Socky. Rept. on Contract AT(45-1)-1350. Sep 59, 53p

HW-69715 $1.10

Hanford Atomic Products Operation, Richland, Wash
SPECIFICATION FOR PROCUREMENT OF ZIRCONIUM-BERYLLIUM BRAZING ALLOY, by W. K. Alexander. May 61, 4p.

KAPL-M-LSD-2 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y.
A COMPILATION OF DIFFUSION DATA FROM UNCLASSIFIED SOURCES FOR ZIRCONIUM, URANIUM AND NIOBIUM SYSTEMS, L. S. DeLuca. Rept. on Contract W-31-109-eng-52. July 61, 18p.

KAPL-M-MJG-2 $2.60

Knolls Atomic Power Lab., Schenectadv. N. Y.
DEVELOPMENT OF A PROCESS FOR FABRICATING BONDED-INCONEL-CLAD OFHC COPPER ROD, by M. J. Galvez. Rept. on Contract W-31-109-eng-52. July 61, 21p.

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Los Alamos Scientific Lab., N. Mex.
COMPACTION AND SINTERING OF PuO_2-Mo POWDER MIXTURES, by W. C. Pritchard, K. A. Johnson and others. Rept. on Contract W-7405-eng-36. Nov 61, 45p.

LAMS-2612 $1.00

Los Alamos Scientific Lab., N. Mex.
THE POWDER ROLLING OF MOLYBDENUM AND TUNGSTEN, by W. H. Lenz and C. E. Peterson. Rept. on Contract W-7405-eng-36. Nov 61, 41p.

TID-14098 $3.60

Michigan State U., East Lansing.
EFFECT OF ISOTOPIC COMPOSITION ON ELECTRICAL RESISTANCE OF LITHIUM, by R. G. Lefflet and D. J. Montgomery. 36p.

NMI-2097 $2.60

Nuclear Metals, Inc., Concord, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY. Progress rept. for July 1961, on Contract AT(30-1)-1565. Oct 61, 27p.

NMI-1250 $0.75

Nuclear Metals, Inc., Concord, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY. EXTRUSION BY HYDROSTATIC PRESSURE, by R. N. Randall, D. M. Davies and others. Final rept. 1 July 60-30 June 61, on Contract AT(30-1)-1565. July 61, 34p.

NMI-1247 $1.25

Nuclear Metals, Inc., Concord, Mass.
FUNDAMENTAL AND APPLIED RESEARCH AND DEVELOPMENT IN METALLURGY. YTTRIUM FABRICATION, by A. L. Geary and P. Loewenstein. Summary technical rept. 1 July 60-30 June 61, on Contract AT(30-1)-1565. July 61, 52p.

PB 158 982 $2.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF MOLYBDENUM AGAINST CORROSION AT HIGH TEMPERATURES, by J. W. Spretnak and Rudolph Speiser. Rept. no. 6, 16 Jan-15 Apr 53, on Contract N6onr-22528. 15 Apr 53, 29p. 3 refs. RF Proj. 467; AD-123 023.

DESCRIPTORS: *Molybdenum, *Alloys, Corrosion inhibition, Temperature, Coatings, *Molybdates, Physical properties.

With a view to developing a self-regenerative, protective oxide coating on molybdenum and molybdenum alloys, further data on the physical properties of the molybdates have been obtained. In particular the thermal stability of a number of molybdates has been determined by differential thermal analysis. These data indicate that only a few of the binary molybdates studied are thermally stable; the majority undergo crystalline phase transitions at elevated temperatures. This behavior is, of course, detrimental to the oxidation resistance of molybdenum alloys.

PB 158 983 $1.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF MOLYBDENUM AGAINST CORROSION AT HIGH TEMPERATURES, by
J. W. Spretnak and Rudolph Speiser. Rept. no. 7, 16 Apr-15 July 53, on Contract N6onr-22528. 1 Aug 53, 15p. 4 refs. RF Proj. 467; AD-16 874.

DESCRIPTORS: *Molybdenum, *Cadmium, *Cobalt, *Nickel, *Alloys, Corrosion inhibition, Temperature, Coatings.

This report deals with the oxidation resistance of certain molybdenum alloys and of molybdenum coated with various metals. Where possible, the surface products formed during heating these samples have been identified. Those metals which form stable molybdates and therefore have some possibility of producing protective coatings on molybdenum have been alloyed with molybdenum. In those cases in which the relative atomic diameters of the metals and molybdenum indicate that the solubility of the metals in molybdenum will be negligible, the metal has been coated on molybdenum. Oxidation tests have then been carried out. Experiments show that nickel molybdate at high temperatures formed a highly protective coating on molybdenum which is broken by spalling on cooling. This result led to the beginning of a thorough investigation of the properties of nickel and cobalt molybdates. (See also PB 158 982)

PB 158 984 $1.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF MOLYBDENUM AGAINST CORROSION AT HIGH TEMPERATURES, by J. W. Spretnak and Rudolph Speiser. Rept. no. 8, 16 July-31 Dec 53, on Contract N6onr-22528. 5 Jan 54, 18p. 13 refs. RF Proj. 467; AD-62 080.

DESCRIPTORS: *Molybdenum, *Nickel, *Alloys, Corrosion inhibition, Temperature, Coatings, *Molybdates, Spallation.

It has been shown that molybdenum-nickel alloys, containing a sufficiently high percentage of nickel, form completely protective self-regenerative coatings on molybdenum in flowing air at 940°C. These coatings, which consist predominantly of nickel molybdate, spall violently off the alloy on cooling. A new coating is formed on reheating. Since repeated heating and cooling with resultant spalling must depreciate the nickel content of the alloy to the point where a protective coating can no longer be formed, work during the past months has been largely devoted to a study of the spalling of nickel molybdate. A search is also being made for a compound which will prevent the spalling of nickel molybdate without spoiling its properties as a protective coating on molybdenum. (Author) (See also PB 158 983)

PB 158 985 $2.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF MOLYBDENUM AGAINST CORROSION AT HIGH TEMPERATURES, by
J. W. Spretnak and Rudolph Speiser. Rept. no. 9, 1 Jan-31 Mar 54, on Contract N6onr-22528. 15 May 54, 21p. 14 refs. RF Proj. 467; AD-64 912.

DESCRIPTORS: *Molybdenum, Corrosion inhibition, Spallation, Temperature, *Nickel, *Cobalt, *Alloys, Coatings, *Molybdates.

The mechanism of spalling has not yet been established conclusively. Spalling of nickel and cobalt molybdates is associated with a phase which appears upon quenching only after heating above certain temperatures. If the phase designated the 'intermediate temperature phase' can be preserved at room temperature by means of the introduction of another component, spalling can be suppressed. This has been accomplished in the case of nickel molybdate by the use of manganese dioxide and in the case of cobalt molybdate by the use of silica, magnesium molybdate, or alumina. The reaction required to produce the stabilized intermediate phase will occur on the surface of an alloy as well as in the free materials. Oxidation products obtained from certain molybdenum base alloys will react to form spinel type oxides. This has been accomplished with mixtures of compounds and by oxidation of the appropriate alloy. Oxidation tests have also demonstrated that molybdenum alloyed with 25% cobalt and 12% silicon is very oxidation resistant at 960°C. A slight adjustment of alloy composition may render the oxide coating completely protective. (See also PB 158 984)

CVNA-93 $6.60

Westinghouse Electric Corp., Pittsburgh, Pa.
WELDING DEVELOPMENT FOR FABRICATION OF CVTR ZIRCALOY FUEL ASSEMBLIES, by
G. G. Lessmann. Rept. on Contract AT(30-1)-2289. 60p.

PB 158 986 $2.60

Ohio State U. Research Foundation, Columbus.
PROTECTION OF MOLYBDENUM AGAINST CORROSION AT HIGH TEMPERATURES, by
J. W. Spretnak and Rudolph Speiser. Rept. nos. 10 and 11, 1 Apr-30 Sep 54, on Contract N6onr-22528. 9 Sep 54, 23p. 6 refs. RF Proj. 467; AD-64 914.

DESCRIPTORS: *Molybdenum, Corrosion inhibition, Spallation, Temperature, *Nickel, *Cobalt, *Alloys, Coatings, *Molybdates.

Spalling in cobalt molybdate on cooling is structural. It is due to an exothermic phase change from the γ phase to the β phase on cooling. It appears extremely likely that spalling in nickel molybdate is almost exactly analogous to that in cobalt molybdate. Stabilization in the γ phase can be effected in nickel molybdate by manganese dioxide. In cobalt molybdate it can be effected by manganese dioxide and possibly by silica or zinc oxide. The γ phase of cobalt molybdate is stabilized by alumina only as a step in the production of the spinel, $CoO \cdot Al_2O_3$. A partially stabilized coating of nickel molybdate was formed on the alloy 68% Mo-22% Ni-10% Mn. An almost completely stabilized coating of cobalt molybdate was produced on the alloy 68% Mo-22% Co-10% Mn. Neither of these coatings was completely protective but it is believed that adjustments of the percentages of the constituents in these alloys will result in the formation of stabilized completely protective coatings. Oxidation of the alloy 63% Mo-25% Co-12% Si indicates that stabilized

cobalt molybdate forms on the surface, but only temporarily. Zirconium molybdate and cupric molybdate have been prepared. (See also PB 158 985)

Structural Metallurgy and Corrosion

ANL-6204 $2.00

Argonne National Lab., Ill.
CORROSION INVESTIGATIONS OF HIGH-TEMPERATURE ALUMINUM ALLOYS, by Norbert R. Grant. Summary rept. Oct 57-Dec 59, on Contract W-31-109-eng-38. Sep 61, 81p.

NAA-SR-5363 $1.00

Atomics International, Canoga Park, Calif.
CORROSION AND ACTIVITY TRANSFER IN THE SRE PRIMARY SODIUM SYSTEM, by H. E. Johnson. Rept. on Contract AT(11-1)-GEN-8. Oct 61, 42p.

KAPL-M-BED-3 $1.60

Knolls Atomic Power Lab., Schenectady, N. Y.
THE CORROSION BEHAVIOR OF HAFNIUM IN AQUEOUS MEDIA AS A FUNCTION OF TEMPERATURE, by B. E. Dearing and A. M. Andrako. Rept. on Contract W-31-109-eng-52. Aug 61, 11p.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

NAS-NS-3047 $0.75

Battelle Memorial Inst., Columbus, Ohio.
THE RADIOCHEMISTRY OF SILVER, by D. N. Sunderman and C. W. Townley. Nov 61, 59p.

BNL-5756 $5.60

Brookhaven National Lab., Upton, N. Y
BROOKHAVEN NATIONAL LABORATORY IN-PILE CHEMO-NUCLEAR LOOP. PRELIMINARY DESIGN. Sep 61, 55p.

GEMP-101 $0.75

General Electric Co., Cincinnati, Ohio.
A METHOD FOR COMPUTING PRIMARY KNOCK-ON SPECTRA AND POPULATIONS IN POLYATOMIC MATERIAL IRRADIATED BY NEUTRONS, by J. R. Beeler and J. L. McGurn. Rept. on Contract AT(40-1)-2847. Oct 61, 30p.

ORO-472 $1.10

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
IONIZATION AND CHARGE TRANSFER CROSS SECTIONS. PHASE III: FAST He^+ IONS INCIDENT ON He, Ne, Ar, H_2, N_2, O_2, and CO, by E. W. McDaniel, D. W. Martin and others. Technical status rept. no. 8, 1 June-31 Aug 61, on Contract AT(40-1)-2591. Sep 61, 8p.

HW-69083 $2.60

Hanford Atomic Products Operation, Richland, Wash.
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Naval Radiological Defense Lab., San Francisco, Calif.
THEORETICAL MODEL FOR MOLECULAR AND PARTICULATE INTERACTION WITH WATER AEROSOL, by R. Caputi. 19 Sep 60, 31p. 8 refs. Research and development technical rept. USNRDL-TR-463; AD-250 228.

DESCRIPTORS: Aerosols, *Fission products, Mathematical analysis, *Underwater explosions, *Nuclear explosions, Sea water, Rare gases, Explosions.

A mathematical model is derived describing the scavenging mechanism of the rare gases, their precursors, and their radioactive daughters by a water aerosol. A major premise of the model is the applicability of the kinetic theory of gases, and it considers only those cases where the solid particulate is sufficiently dispersed such that kinetic theory can be applied. The final results of the derivation are given in the form of three rate constants, for the scavenging rate of the solid particulate by the water aerosol and the exchange rates of the gas between the water droplets and the surrounding atmosphere. By the use of these rate constants and the differential rate equations the concentration distribution as a function of time, droplet radius, droplet density, and temperature for a nuclide is derived. (Author)

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DESCRIPTORS: *Ionization chambers, Theory, *Gas ionization, *Dosimeters, X-rays, Gamma rays, Fast neutrons, Beta particles, Absorption, Measurement, Handbooks

The purpose of this report is to present a critical review of the literature concerning the stopping power ratio that is used in the interpretation of cavity ionization measurements in radiation dosimetry. The Bragg-Gray principle, which is discussed in detail, is the basic formula relating the ionization in a cavity chamber to the energy absorbed in the chamber wall material. One of the terms in this formula represents the ratio of energy absorption in the wall material to that in the gas. This term is called the stopping power ratio and will be denoted by s or $_m s$, when speaking of energy absorbed per cubic centimeter or per gram, respectively. It is the evaluation of this term with which this report is primarily concerned.

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SURVEY OF RADIOACTIVE WASTE DISPOSAL SITES. Technical rept. on Contract AT (04)-3)-331. July 61, 166p.

TID-12383 $2.50

Sanitary Engineering Research Lab., U. of Texas, Austin.
REACTOR FUEL WASTE DISPOSAL PROJECT PERMEABILITY OF ROCK SALT AND CREEP OF UNDERGROUND SALT CAVITIES, by T. D. Reynolds and E. F. Gloyna. Final rept. on Contract AT(11-1)-490. Dec 60, 139p.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

PB 159 070 $11.00

Industrial Test Lab., Philadelphia Naval Shipyard, Philadelphia.
LABORATORY TESTS TO DETERMINE ANY ADVERSE EFFECTS OF HIGH OR LOW HUMIDITY ON MATERIALS AND EQUIPMENT FOUND ABOARD U.S. NAVAL VESSELS. [1949] 149p. 2 refs. I.T.L. rept. no. 3014-A.

Portions of this report will not reproduce well.

DESCRIPTORS: *Naval vessels, Materials, Electronic equipment, Electrical equipment, *Humidity, Tests, *Humidity cabinets, Humidity sensitive elements, Shipborne, *Naval supplies, Tensile properties, Exposure.

PHYSICS

NYO-9495 $1.60

Inst. of Mathematical Sciences, New York U., N. Y.
THE MOTION OF A CHARGED PARTICLE NEAR A ZERO FIELD POINT, by Roger Van Norton. Rept. on Contract AT(30-1)-1480. July 61, 20p. MF-23.

UCRL-6473 $1.75

Lawrence Radiation Lab., U. of California, Livermore.
ANNOTATED BIBLIOGRAPHY OF THEORIES OF THE EQUATION OF STATE OF IONIZED GASES AND STRONG ELECTROLYTE SOLUTIONS, by Stephen G. Brush and Carl J. Wensrich. Rept. on Contract W-7405-eng-48. Aug 61, 73p.

ORNL-TM-25 $1.10

Oak Ridge National Lab., Tenn.
THE CYCLOTRON RESONANCE INSTABILITY WITH NEGATIVE MASS IONS, by T. K. Fowler and E. G. Harris. Oct 61, 5p.

MATT-Q-16 $3.60

Plasma Physics Lab., Princeton U., N. J.
QUARTERLY REPORT, 1 July-30 Sep 61, on Contract AT(30-1)-1238. Nov 61, 34p.

K-1464 $0.75

Union Carbide Nuclear Co., Oak Ridge, Tenn.
THE EFFECT OF SURFACE FLOW ON THERMAL TRANSPIRATION IN POROUS MEDIA, by E. N. Lassettre and A. A. Brooks. Rept. on Contract W-7405-eng-26. Nov 61, 35p.

K-1496 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
TRIP REPORT ON INTERNATIONAL CONFERENCE ON MAGNETISM AND CRYSTALLOGRAPHY, KYOTO, JAPAN, AND VISITS TO FOUR JAPANESE LABORATORIES, by Warren W. Harris. Rept. on Contract W-7405-eng-26. Nov 61, 13p.

Acoustics

PB 157 351 $4.60

J. G. Engineering Research Associates, Baltimore, Md.
VIBRATIONS OF THICK AND THIN CYLINDRICAL SHELLS SURROUNDED BY WATER, by Joshua E. Greenspon. Technical rept. no. 4 on Contract Nonr-2733(00). Sep 60, 42p. 11 refs; AD-249 643.

DESCRIPTORS: *Cylindrical bodies, Structural shells, Elasticity, Vibration, Sound, Transmission, *Underwater sound transmission, Programming, Computers, Audiofrequency cables, Mathematical analysis, *Dynamics, Theory.

This report treats the free and forced vibrations of infinitely long pressurized cylindrical shells surrounded by water and containing fluid. Exact elasticity theory is used to treat unpressurized shells, and an approximate shell theory is employed to treat the effects of static pressure, internal fluid, and structural damping. A study is made of the effects of these parameters on the dynamic behavior of the shell. Comparisons are made between the results of the exact and approximate theories. (Author)

NYO-9540 $1.10

Rochester U., N. Y.
A SONIC SPARK LOCATER, by H. W. Fulbright and D. Kohler. Rept. on Contract AT(30-1)-875. Sep 61, 5p.

Electricity and Magnetism

BNL-5750 $2.60

Brookhaven National Lab., Upton, N. Y.
HALL PROBE REGULATOR ACTION AND HALL GENERATOR EVALUATION, by A. V. Soukas. June 61, 11p.

BNL-5662 $4.60

Brookhaven National Lab., Upton, N. Y.
SOLID STATE PRECISION CURRENT SHUNT FOR EXPERIMENTAL MAGNETS, by J. P. Palmer, W. A. Higinbotham, and W. Merkle. July 61, 23p.

AD-255 317 $13.00

Electronic Defense Lab., Mountain View, Calif.
FERROELECTRIC BIBLIOGRAPHY, by Robert D. Hall. Rept. on Contracts DA 36-039-sc-85402 and DA 36-039-sc-87475. 10 Mar 61, 153p. 1611 refs. Technical memo. no. EDL-M35p, supersedes Technical memo. no. EDL-M165; AD-210 781, PB 155 161.

This report released by the cognizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Ferroelectric crystals, *Ferroelectric materials, *Ferroelectricity, *Bibliography

The categorization of articles by subject is arbitrary in the choice of categories, and in the assignment of articles to categories. The arrangement is intended to provide an approximate guide to the literature which the user of the bibliography may refine to fit his purpose. The format of the bibliography is improved by placing ten references on each page except for two pages where this was impossible. The format of the individual references is based on that of the American Physical Society. The order is intentionally alphabetical by author except for a short supplement of articles at the end of the text. These articles came to our attention after the earlier text had been completed. (Author)

Molecular Physics and Spectroscopy

TID-13601 $1.60

New York U., N. Y.
THE SPECTRA OF MANGANESE AND COBALT IONS IN FUSED HALIDES, by Benson Ross and Maret Kukk. Technical progress rept. on Contract AT(30-1)-1938. July 61, 14p.

PB 155 447 $1.10

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE FREE-FREE CONTINUUM OF NITROGEN, by R. G. Breene, Jr. and Maria Nardone. Rept. on Contract AF 04(647)269. Mar 61, 7p. 4 refs. Technical Information Series R60SD476; AD-253 391.

DESCRIPTORS: *Continuum mechanics, Oxygen, *Nitrogen, *Wave analysis, Bessel functions, Electron transitions, Mathematical analysis, *Electrons, Determination, Quantum mechanics, Atoms.

Methods previously developed for the computation of free free continua without recourse to experimental data are applied to the determination of this continuum for an electron in the presence of neutral nitrogen. There is no smearing of the cross sections, and the calculation covers the spectral region 5,000 to 30,000 angstroms. The thin layer radiant intensity in the nitrogen continuum at a given frequency is roughly one-quarter that in the oxygen continuum. The application of Kramers' theory to this continuum would require an effective Z of 0.227 at 10,000 angstroms and an effective Z of 0.176 at 20,000 angstroms. (Author)

K-1495 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
TRIP REPORT ON INTERNATIONAL CONFERENCE ON SPECTRAL LINE SHAPE AND MOLECULAR INTERACTIONS, REHOVOTH, ISRAEL, AND VISITS TO SEVERAL EUROPEAN LABORATORIES, by DeForest F. Smith. Rept. on Contract W-7405-eng-26. Nov 61, 19p.

Optics

UCRL-9727 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
OPTIK: AN IBM 709 COMPUTER PROGRAM FOR THE OPTICS OF HIGH-ENERGY PARTICLE BEAMS, by Thomas J. Devlin. Rept. on Contract W-7405-eng-48. Sep 61, 28p.

PB 159 083 $3.60

Research Inst., U. of Michigan, Ann Arbor.
Z-6t FILTER SETS, SERIAL NO. 1, by E. A. Boettner, H. F. Reiher, and Franklin White. Rept. on Contract NObsr-52387. 7 June 54, 32p.

Portions of this report will not reproduce well.

DESCRIPTORS: *Infrared filters, *Test sets, *Photometers, Design, Operation, Maintenance, Optical systems.

The Z-6t filter test sets described in this manual were originally designed by the Naval Research Laboratory and their operation was discussed in the report "Instruction Manual for NRL Filter Photometers" by J. D. Purcell, dated 13 November 1946. This report contains operating and maintenance instructions, and describes changes made in the original NRL design.

Solid State Physics

PB 158 582 $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
AN OPTIMAL SEQUENTIAL ACCELERATED LIFE TEST WITH EXPONENTIAL DEPENDENCE ON STRESS, by Gideon Schwarz. Technical rept. no. 67 on Contract Nonr-225(52). 12 Dec 60, 12p. 3 refs. AD-251 283.

DESCRIPTORS: *Stresses, Failure (Mechanics), *Games theory, *Statistical tests, Sequences.

In Technical Rept. 65 of the present series Bessler, Chernoff and Marshall present a method for obtaining optimal sequential designs for experiments to test whether a device subjected to standard stress has an expected lifetime exceeding a specified value. It is assumed there that the lifetime is exponentially distributed, with expectation a function of the stress and an unknown parameter. The case in which that function is the inverse of a quadratic is solved in explicitly. The same method is now applied to the case where the dependence of the expected lifetime on the stress is exponential. (Author)

PB 155 947 $2.60

Bell Telephone Lab., Inc., New York.
FUNDAMENTAL STUDIES OF THE PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS. Interim rept. no. 1, 1 July-30 Sep 60, on Contract DA 36-039-sc-85364. [1960] 29p. 27 refs. Rept. no. no. 25334; AD-249 958.

DESCRIPTORS: *Quartz crystals, *Electrical conductance, Conductivity, Crystal structure, Lattices, Acoustics, Silver, Diffusion, Chemical impurities, Electrodes, Color centers, Electromagnetic waves, Absorption.

The initial and final axial electrical conductivity of natural quartz at 500 degrees C in general are found to be of the same order of magnitude as those for Z-growth synthetic quartz. Loss in weight in natural samples is a decade below that predicted on the basis of a dissociation of the silica tetrahedra with subsequent removal of oxygen. In marked contrast with natural quartz, a massive transport of silver does not occur in specimens of Z-growth (fast-growth material) synthetic quartz subjected to an axial electric field at elevated temperatures. This fact together with the appearance of regions of dark coloration in the synthetic quartz, so treated, suggests the existence of

quartz substructures in the Z-growth material. These decorated regions are felt to be interfacial zones and therefore regions of considerable misalignment of the quartz lattice. Measurements of the acoustic absorption in quartz have been extended to temperatures in the neighborhood of the alpha-beta inversion point. (Author)

AD-257 969 $4.60

Bell Telephone Labs., Inc., Murray Hill, N. J.
SOLID-STATE MASER RESEARCH, by E. D. Reed. Quarterly rept. no. 3, 20 Dec 60-20 Mar 61, on Contract DA 36-039-sc-85357. 20 Mar 61, 42p. 14 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Microwave amplifiers, Amplifiers, L-band, *Ruby, Magnetic fields, *Gadolinium, Calcium compounds, Tungstates, *Paramagnetic resonance, Lattices, Cobalt, Chemical impurities, Aluminium compounds, Oxides, Mathematical analysis, Scientific research, Maser

Contents:
Ruby orientation in a traveling-wave maser
Gadolinium in calcium tungstate as a maser material
Stagger-tuning of traveling-wave masers
Harmonic spin coupling
Paramagnetic resonance properties of cobalt-doped Al_2O_3

AD-258 444 $2.60

Bell Telephone Labs., Inc., Whippany, N. J.
PROPERTIES OF NATURAL AND SYNTHETIC QUARTZ CRYSTALS, by J. C. King. Interim rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85364. 22 May 61, 22p. 7 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Quartz crystals, Growth, *Quartz resonators, Internal friction, Physical properties, Electrolysis, Diffusion, Acoustics, Temperature, Radiation damage, Absorption, Crystals.

Contact metal electrodes used in electrolyzing quartz yield incompletely treated material and vapor-plated gold electrodes are superior.

AD-256 876 $7.60

David Sarnoff Research Center, Princeton, N. J.
RESEARCH IN ELECTRON EMISSION FROM SEMICONDUCTORS, by R. E. Simon and E. K. Gatchell. Quarterly rept. no. 2 (Rept. no. 10), 1 Jan-31 Mar 61, on Contract DA 36-039-sc-87388, continuation of Contract DA 36-039-sc-78155. [1961] 74p. 86 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61
DESCRIPTORS: *Thermionic emission, Theory, Materials, *Fluid emission, *Semiconductors, Coupling circuits, Electrons, Temperature, Surfaces, Electric fields, Cesium, Metals, Conductivity, Crystals, Voltage, Lattices, Plasma physics, Electron optics, Analysis, Measurement

A review of hot electron effects in the multiplication region is presented. This is a continuation of the literature survey the first half of which was presented in the previous quarterly report. Experimental work on multiplication, avalanche breakdown, and microplasmas and theoretical attempts to explain these data are discussed. The state of knowledge on the effect of low work function metals in reducing the electron affinity of semiconductors is described. A brief review of the published reports of hot electron emission is presented. A model for hot electron emission from a p-n junction is described and the implications of the results of the literature survey on the design of the junction for optimum hot electron emission are considered. (Author)

AD-259 762 $2.60

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH IN PHYSICAL CHEMISTRY AND METALLURGY OF SEMICONDUCTING MATERIALS, by K. E. Bean and R. J. Starks. Quarterly rept. no. 4, 15 Feb-15 May 61, on Contract DA 36-039-sc-85131. [1961] 28p. 2 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Semiconductors, Materials, *Boron, Single crystals, Production, Preparation, Physical properties, Chemical properties, Electrical properties, Impurities, Silicon, *Boron compounds, *Bromides, Synthesis, Purification, Separation, Carbon, Determination

Si was the only impurity of any significance detected by spectrographic analyses in the B produced. Si is quite thoroughly removed from BBr_3 during fractional distillation. B-coated graphite electrodes, of large diameter, were used in an attempt to completely eliminate the possibility of contamination from carbon. Initial heating up of the B filament, in the H reduction unit, is now being carried out in helium. This has eliminated cracking of the filament which occurred when the initial heating up was in hydrogen. Work has been started toward improving the present method of determining C in boron. Boron bars were successfully float zoned in a vacuum. Zone passes were carried out at pressures from 0.7 to 10 microns of mercury. Bars produced under these pressures were superior to those zoned in inert gas ambient. P-N junctions were obtained in vacuum zoned material by diffusion of W into the crystals. (Author)

AD-259 477 $3.60

IBM Command Control Center, Federal Systems Div., Kingston, N. Y.
VAPOR PHASE GROWTH OF SILICON, by H. J. Beatty, R. Glang, and J. G. Kren. Quarterly progress rept. no. 3 (Rept. no. 7) 1 Feb-30 Apr 61, on Contract DA 36-039-sc-87395, continuation of Contract DA 36-039-sc-84547. [1961] 36p. 2 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Silicon, Single crystals, Growth, Deposits, *Semiconductors, *Transistors, Silanes, Reduction, Hydrogen, Silicon compounds, Chlorides, Thin films, Crystal structure, Lattices, Deformation, Impurities.

Two different systems were developed to investigate the deposition of single crystalline Si through the H reduction of trichlorosilane. With these systems, numerous deposition experiments were made in an attempt to establish the optimum operating conditions. The quality and properties of vapor grown Si films have been found to depend on many process parameters in a complex pattern. Some of these parameters have been studied individually, and their influence on the grown Si film has been identified. The investigation is not yet complete enough to offer a fully controlled process. More and systematic experiments are required to allow controlled doping, and additional attention has to be given to the problem of crystal perfection. (Author)

PB 155 559 $5.60

New York U., N. Y.
STUDIES OF PHOTOCONDUCTIVITY AS A FUNDAMENTAL PROPERTY OF PHOSPHORESCENT MATERIAL, by Hartmut Kallmann. Progress rept. no. 7, 15 Dec 52-15 Mar 53, on Contract DA 36-039-sc-15297. July 53, 53p. 4 refs. AD-16 777.

DESCRIPTORS: *Photoconductivity, *Phosphors, Phosphorescence, Ultraviolet radiation, Electricity, Single crystals, Phosphorescent materials, Materials, Anthracenes, Cadmium, Chrysenes, Crystals, Fluoranthenes, Stilbenes, Zinc, Sulfides, Polorization, Light, Luminescence.

Photoconductivity of organic substances: Photocurrents in 23 substances were studied by depositing the substances on conductive glass electrodes in powder form and irradiating them with UV light of about 10 μw/sq cm. The currents obtained for the highest potential that could be applied to each sample are listed. Chrysene showed the greatest UV photoconductivity, and 9, 10-dichloro-1, 3-dibromoanthracene showed the greatest visible light photoconductivity. Persistent interior polarization: Discussions are given pertaining to the sensitivity of interior polarization to low light intensities, substances showing interior polarization, dark polarization in power 1508, visible light polarization in quenched 1508 powder, polarization produced by fast electron bombardment, charge distribution in a polarized sample, and the effect of preillumination on UV polarization. Light emission and photoconductivity of luminescent substances: Measurements of the induced light emission and conductivity of RCA no. 2046, a Cu-activated ZnCdS(76% ZnS, 24% CdS). The induced-current and quenching curves are almost identical to those for RCA 2040 which contained no Cd. The polarity effect decreases from a factor of 5 at LV to only 2 at HV. Photoconductivity of single inorganic crystals: Three methods for accurately measuring photoconductivity are discussed.

AD-258 508 $7.60

New York U. Coll. of Engineering, N. Y.
STUDY OF SHORT TERM STABILITY OF CRYSTAL OSCILLATORS, by James Rarity, Lester Saporta, and Gerald Weiss. Quarterly rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85376. [1961] 72p. 6 refs.

This report released by the cognizant military agency for sale to the public 13 Dec 61

DESCRIPTORS: *Crystal oscillators, Errors, Oscillators, Stability, *Frequency stabilizers, Frequency multipliers, Test equipment, Measurement, Low pass filters, Mathematical analysis, Phase measurement, Reduction

This report includes a set of design curves which facilitate the selection of the operating parameters of the multiplier-heterodyne frequency measuring system and a discussion of the improvement in measurement uncertainty afforded by utlizing a filter to reduce the random effects introduced by a non-ideal multiplier. The effects of random noise added to a sine wave on the mean value and variance of the zero crossings are also discussed. (Author)

AD-259 354 $1.60

Polytechnic Inst. of Brooklyn, N. Y.
THIN FILMS OF FERRIMAGNETIC OXIDES. Progress rept. no. 11, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-78107. 31 Mar 61, 7p.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Ferromagnetic materials, *Ferrites, *Thin films, *Garnet, Iron compounds, Yttrium compounds, Oxides, Nickel compounds, Manganese compounds, Powder metals, Spinel, Magnetic properties, Microwave frequency, Measurement, Phase studies, Production, *Metal films, Chemical analysis, High temperature research, Vapor plating, Evaporation

Additional measurements at microwave frequencies of a number of ferrimagnetic oxide films are reported and analyzed. Continuing work on evaporation procedure is mentioned along with preliminary findings concerning a procedure for the wet chemical analysis of oxide films containing iron cations. (Author)

AD-259 699 $4.60

Purdue Research Foundation [Lafayette, Ind.]
SEMICONDUCTOR RESEARCH. Quarterly rept. no. 2, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-87394. [1961] 42p. PRF 2641.

DESCRIPTORS: *Semiconductors, Electrical properties, Optics, Radiation damage, *Low temperature research, Intermetallic compounds, Transport properties, Specific heat, Magnetic properties, Magnetic susceptibility, Materials, Absorption, Infrared radiation, Paramagnetic resonance, Thermal conductivity, Cryogenics, Gallium alloys, Tellurium, Germanium, Silicon, Antimony alloys, Zinc, Copper, Magnesium alloys, Neodymium alloys, Germanium alloys, Copper alloys, Zinc alloys

Contents:
Electrical and optical properties: absorption edge in GaSb; galvanomagnetic effects in n-GaSb; infrared absorption in GaSb; recombination radiation in GaSb; hot carrier mobility and ionization studies in p-type Ge; infrared measurement of hot carrier temperature in p-type Ge; microwave conductivity of semiconductors

Irradiation effects: paramagnetic resonance in neutron irradiated Si; paramagnetic resonance in semiconductors

Low temperature studies: effect of uniaxial stress on the thermal conductivity of Ge at low temperatures; preparation of Mg base alloy samples; electrical measurements on Ge at very low temperatures; Ge resistance thermometers

General: recombination of electrons and donors in n-type Ge; infrared absorption in p-type Ge; material preparation

Theoretical Physics

PB 155 748 $1.60

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF ELECTROMAGNETIC INTERACTIONS IN PLASMAS, by R. W. Gould and D. G. Dow. Quarterly progress rept. no. 2, 1 May-30 June 60, on Contract DA 36-039-sc-85317. [1960] 15p. AD-244 062.

DESCRIPTORS: *Plasma physics, *Plasma oscillations, Cyclotrons, *Magnetic fields, Design, Electromagnetic effects, Discharge tubes, Microwave equipment.

Further design considerations are given for the cyclotron orbit oscillator. Measurements of resonant frequencies of cylindrical plasma columns of three different diameters were completed in waveguide and coax geometry. Additional resonances which are probably associated with quadrupole and octupole modes were detected in the coax geometry. (Author)
(See also PB 152 996)

PB 157 293 $2.60

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF ELECTROMAGNETIC INTERACTIONS IN PLASMAS, by R. W. Gould and D. G. Dow. Quarterly progress rept. no. 3, 1 July-30 Sep 60, on Contract DA 36-039-sc-85317. [1960] 26p. 3 refs. AD-251 019.

DESCRIPTORS: *Cyclotrons, Oscillators, Design, *Plasma physics, Frequency, Density, Electrons, Scattering, Magnetic fields, *Plasma oscillations, Microwave equipment, Discharge tubes.

Design parameters are considered for the cyclotron-orbit oscillator, and the effect of non-uniform plasma density is considered. If the device will oscillate at all, it will be at a frequency below that characteristic of the lowest density on the loop. The path length is more than adequate for oscillation if the density can be kept uniform. Data are presented on the Heil discharge showing the existence of two groups of electrons; the beam electrons and the background plasma electrons. The temperature of the latter is about 50,000 K, and the former has an energy spread of approximately 25 volts. Equations for the theoretical study of scattering from a plasma column were formulated which include the effect of non-uniform plasma density distribution and the propagation of plasma waves in the medium. (Author)

PB 157 294 $1.60

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF ELECTROMAGNETIC INTERACTIONS IN PLASMAS, by R. W. Gould and D. G. Dow. Quarterly status rept. no. 4, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-85317. [1961] 17p. 2 refs. AD-254 895.

DESCRIPTORS: *Plasma physics, Microwave, Cesium, Electron beams, *Magnetic fields, *Plasma oscillations, Microwave equipment, Discharge tubes, Electromagnetic effects, Design.

Progress on the cyclotron orbit oscillator is described and a study of cesium plasmas for use in microwave interaction experiments was initiated. Preliminary probe measurements with the first cesium plasma tube was reported. (Author)

NYO-9753 $1.10

Rochester U., N. Y.
CONVERGENCE OF THE PERTURBATION EXPANSION IN SOME MODELS OF THE FIELD THEORY, by L. Bialynicki-Birula and William M. Frank. Rept. on Contract AT(30-1)-875. Sep 61, 6p.

NYO-9749 $2.60

Rochester U., N. Y.
THE QUANTUM MECHANICAL SCATTERING PROBLEM II: MULTI-CHANNEL SCATTERING, by Thomas F. Jordan. Rept. on Contract AT(30-1)-875. n.d. 26p.

Thermodynamics

PB 158 944 $5.60

Aerojet-General Corp., Azusa, Calif.
HEAT-TRANSFER STUDIES, by T. C. Core, J. F. Harkee and others. Final rept. on Contract AF 33(616)5289. Sep 59, 52p. 5 refs. Rept. no. 1671; WADD-TR-60-239; AD-238 273.

DESCRIPTORS: *Heat transfer, *Hydrogen, Liquefied gases, *Coolants, *Cryogenics

Heat transfer to hydrogen in the regions of forced convection in the liquid and gaseous phases, nucleate boiling, and stable film boiling has been investigated with a blow-down type apparatus utilizing an electrically heated stainless-steel tubular test section through the following range of conditions: Velocity, 25 to 55 ft/ sec; Inlet bulk temperature, 40 to 57°R; Outlet bulk temperature, 40 to 147°R; Inlet pressure, 28 to 213 psia; Heat flux, 0.01 to 6.0 Btu/in.^{2} sec; Wall temperatures, 51 to 1505°R. All experiments were terminated prior to tube burnout. Based on the experimental heat-flux data on hydrogen under conditions of stable film boiling and forced convection in the gaseous phase, the heat-transfer analysis in a low-pressure thrust chamber was carried out. The results indicate the feasibility of employing hydrogen as a regenerative coolant. (Author)

HW-63678(Rev.) $1.00

Hanford Atomic Products Operation, Richland, Wash.
HEAT TRANSFER EXPERIMENTS CONCERNING THE PRTR MARK I FUEL ELEM'.NTS, G. M. Hesson. Rept. on Contract AT(45-1)-1350. Nov 60, 40p.

UCRL-5409 $1.10

Lawrence Radiation Lab., U. of California, Livermore.
HIGH TEMPERTAURE PRODUCTION AND MEASUREMENT. A BIBLIOGRAPHY, by Frederick E. Frost. Rept. on Contract W-7405-eng-48. Nov 58, 9p.

Wave Propagation

AD-257 535 $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
IONOSPHERIC RESEARCH AND PROPAGATION STUDIES, by H. D. Webb and R. A. Davidson. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61, on Contract DA 36-039-sc-85173. [1961] 16p.

This report released by the cognizant military agency for sale to the public 13 Dec 61.

DESCRIPTORS: *Radio astronomy, Scientific research, *Radio signals, Ionosphere, Ionospheric propagation, Moon, Radio waves, Reflection, *Electromagnetic wave reflections, Measurement, Satellite vehicles, Installation, Antennas, Radio interference, Calibration, *Solar noise, *Parabolic antennas, Radio receivers, Sun, Stars.

A description of the progress in the construction of the new site and installation of the equipment is given. Preliminary calibration and operational checks have been made. Samples of radio noise from the sun at 151 and 413 mc are presented. Checks of this sort are to be used to check antenna beamwidth and directional accuracy. A sample of radio noise from the radio star Cygnus is presented. A calibration shows the star flux density as about 30 x 10^{-24} watts per cycle per square meter. (Author)

PB 161 603 $3.00

National Bureau of Standards, Boulder, Colo.
PERFORMANCE PREDICTIONS FOR SINGLE TROPOSPHERIC COMMUNICATION LINKS AND FOR SEVERAL LINKS IN TANDEM, by A. P. Barsis, K. A. Norton and others. Aug 61, 161p. 39 refs. Technical note no. 102.

DESCRIPTORS: Atmosphere, *Radio waves, Propagation, *Radio transmission, Transmission lines, *Radio communication systems, Communication systems, Reliability, Probability, Attenuation.

Performance of long-distance tropospheric communication circuits, either singly or in tandem, is predicted in terms of the probability of obtaining a specified grade of service or better for various percentages of time. The grade of service is determined by the minimum acceptable ratio of hourly median predetection-RMS-signal-to-RMS-noise for the type of intelligence to be transmitted.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 158 909 $7.60

Colorado Research Corp., Denver.
A RESEARCH STUDY AND ENGINEERING INVESTIGATION OF A DIGITAL TELEVISION SYSTEM, by W. C. Coombs, R. G. Salaman, and D. E. Cottrell. Final rept. for 1 Dec 57-1 June 59 on Contract DA 36-039-sc-74928. 75p. 14 refs. AD-228 208.

DESCRIPTORS: Digital systems, *Television communication systems, Design, Coding, Multiplex transmission, Signal-to-noise ratio, Pulse modulation, Military communications, Communication systems, Communication theory.

New scanning standards were developed which produce a subjectively acceptable picture and reduce the bandwidth two to one over the commercial standards. Many methods of digital modulation were developed and categorized under applications where best suited. The best general purpose method, Difference Signal Modulation, produces a picture showing no contouring with the lowest ratio of analog to digital bit rate in the frequency range specified. Other encoding methods may be used to better advantage in specific applications. Some aspects which relate information theory to digital transmission properties are developed throughout the report. It appears that increasing the sampling rate for a given analog bandwidth always greatly increases the signal-to-noise ratio. Theoretical and experimental results show optimum scanning and pulse rates for the lowest possible bandwidth. Studies dealing with transmission properties, advanced encoding techniques, and redundance removal methods are recommended to be undertaken as future projects. (Author)

TID-6793 $0.75

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
VISIT OF U.S. TEAM TO USSR ATOMIC ENERGY INSTALLATIONS. Oct 59, 29p.

SOCIAL SCIENCES

PB 158 932 $2.60

Engineering Div., Air Materiel Command, Wright-Patterson AFB, Ohio.
LEGIBILITY OF PRINTED MATERIALS, by Katherine D. Young. Memo. rept. 10 June 46, 29p. 24 refs. Serial no. TSEAA-8-694-1A; ATI-110 570.

DESCRIPTORS: *Printing, Standards, *Reading

Studies published in the psychological literature, on legibility of printed materials, have been reviewed. The most important of these studies are summarized. The studies are concerned with discovering the conditions under which printed material is best suited to the capacities and habit patterns of the average person.

PB 159 009 $7.60

Operations Analysis Office, Air Force Missile Test Center, Patrick AFB, Fla.
A HOUSING MARKET STUDY OF BREVARD COUNTY FOR AFMTC EMPLOYEES, by Clifton A. McClelland. Apr 59, 78p. 21 refs. OA TR-59-2; AFMTC TR-59-8; AD-215 469.

DESCRIPTORS: *Housing, Economics, Florida, Sociology.

Study of the housing in Brevard County, Florida was made to help resolve housing problems of Air Force Missile Test Center employees. Brevard County's economy has changed from agriculture and tourist to industrial with missile orientation. The population likewise has grown faster than other Florida counties for the period. During a part of this rapid growth period homebuilders were not able to meet the pressure of the demand for dwellings, resulting in an increase in house trailers and a "doubling up" of families. To determine the present housing market situation, factors such as the county's ability to attract and hold workers, housing trends, rental market, economic background, as well as the key element of the demand population were analyzed. The present housing market on the basis of these factors appears to be in a state of equilibrium between demand and supply. In the five-year forecast based on population projection the demand created by the AFMTC employees was isolated. The next five-year growth, it is believed, will provide a more rapid increase in tourist accommodations and personal services including shopping facilities, and should result in a more diversified economy for the area.

PB 159 008-1 $6.60

Operations Analysis Office, Air Force Missile Test Center, Patrick AFB, Fla.
A PREDICTION MODEL FOR POPULATION IMPACT BY MILITARY INSTALLATIONS, PART I, by Clark N. Crain and Louis R. La Perriere. (Operations Analysis Standby Unit, U. of Denver). Mar 59, 67p. 69 refs. AFMTC TR-59-5(I); AD-242 384.

DESCRIPTORS: *Population, *Military facilities, Housing, Urban areas, Education, Hospitals, Roads, Recreation, Growth.

The influx of large numbers of people into relatively small communities selected as the sites for large Defense Installations can quickly overburden (impact) civic and commercial facilities in the categories of housing, schools, hospitals, roads, recreation, goods, services, etc. A cross section in time is presented of the impact of population on the communities of Brevard County, Florida. It covers the period 1950 to 1958 and, in detail, the critical phase of the impact to cutoff, 1952-58, being essentially historical in nature. However, no attempts are made to suggest recommendations for action. The patterns and influences of population impact in Brevard County are traced. (Author)

PB 159 008-2 $2.60

Operations Analysis Office, Air Force Missile Test Center, Patrick AFB, Fla.
A PREDICTION MODEL FOR POPULATION IMPACT BY MILITARY INSTALLATIONS, PART II, by Clark N. Crain (Operations Analysis Standby Unit, U. of Denver). Mar 59, 22p. OA TR-59-1(II); AFMTC TR-59-5(II); AD-242 385.

DESCRIPTORS: *Population, *Military facilities, Growth, *Mathematical prediction, Military personnel, Housing, Education, Roads, Hospitals.

An empirically derived model for estimating the total population increases to be associated with any future Defense Installation for which the direct personnel to be employed and size of the communities to be affected are known is presented. In the categories of houses, schools, roads and hospital beds, the model suggests a means of approximating the number of additional units and the dollar investment required to satisfy the direct and indirect populations to result. (Author)
(See also PB 159 008-1)

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- Establishing a new business

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- Basic records of national income and product, regional trends, balance of payments, foreign aid

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- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

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- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
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